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Status and distribution of wolves in the northern Rocky Mountains of the United States

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THE STATUS AND DISTRIBUTION OF WOLVES IN THE NORTHERN ROCKY MOUNTAINS OF THE UNITED STATES

By

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ABSTRACT

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The status and distribution of wolves in the northern Rocky Mountains and legal and historical considerations were investigated between October 1974 and March 1977.

Idaho and Wyoming state laws call for the elimination of wolves. Because these laws are superseded by the Endangered Species Act of 1973, they are probably not enforceable. Montana state endangered species legislation complies with the federal law. Wolves are not classified as endangered in Canada; British Columbia and Alberta provincial laws allow for regulated taking of wolves.

Because wolves are secretive, elusive, and scarce in the northern Rockies, reports of wolves or wolf sign were used to estimate population status and distribution. Wolf observation reports (WOR) included accounts of sightings, howlings, tracks, dens, scats, kills, dead wolves, and scent posts; 372 WOR's were collected; 93 were rated questionable and not used in estimating population status and distribution.

Two clumpings of reports became apparent, one in northern Montana and adjacent areas of British Columbia and Alberta, centered around Glacier National Park of Montana and the Bob Marshall Wilderness Area. The other clumping was in the Beaverhead National Forest of southwestern Montana and the adjacent Salmon and Targhee national forests of Idaho. A minimum of 17 to 23 wolves were found to possibly occur in areas of Montana and Idaho.

Possible methods of increasing present wolf numbers include transplanting, increasing prey numbers, increasing the size of wilderness areas, and decreasing man-caused mortality.

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My parents, Les and Alva Day, provided me with a secure, happy, loving home and with an appreciation and respect for wildlife and the outdoors. Acknowledge seems a cold word to express my thoughts for them.

Finally, and most importantly, I thank Crystal Day, my wife, for trusting and believing in me.

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CHAPTER I

INTRODUCTION

Taxonomy and Original Distribution

Historically, the gray wolf (Canis lupus) had one of the most widespread distributions of any land mammal. Young and Goldman (1944) wrote:

> It seems doubtful whether any other species of land mammal has exceeded this geographic range, and this wolf may, therefore, be regarded as the most highly developed living representative of an extraordinarily successful mammalian family.

Wolves occurred throughout North America, Europe (except the British Isles), and Asia, except for Japan and the Indochina Peninsula (Mech 1970). In North America, wolves roamed everywhere but the arid deserts of California and Nevada (Aulerich 1964). Today the distribution of wolves is restricted, primarily because of persecution by man (Young and Goldman 1944, Young 1946, Aulerich 1964, Mech 1970, Theberge 1973, Mech 1974).

Young and Goldman (1944) described 23 subspecies of gray wolves in North America. Hall and Kelson (1959) expanded that into 24 subspecies of which 8 occurred in the lower 48 states of the United States. Today, rather than dealing with subspecies, the species is

federally classified under provisions of the Endangered Species Act of 1973 (P.L. 93-205, as amended) in the lower 48 states. Under the Act, gray wolves in northern Minnesota are classified threatened while elsewhere in the lower 48 states, they are classified endangered.

This paper discusses the status and distribution of wolves occurring in the geographic area described by Young and Goldman (1944) as occupied by the subspecies Canis lupus irremotus, the northern Rocky Mountain wolf (NRMW). Goldman (1944) described NRMW as follows:

> A light-colored subspecies of medium to rather large size . . . similar in size to youngi of the more southern Rocky Mountain region, but whiter, the upper parts less heavily overlaid with black; . . . Size larger and color whiter than in nubilus of Nebraska or in fuscus of Oregon. . . . Differs from occidentalis of Mackenzie in decidedly smaller size. Differs from columbianus of central British Columbia in smaller average size, paler, less "cinnamon-buff" coloration . . . individuals in the black phase appear to be rare.

The original distribution of NRMW included the northern Rocky Mountain region and high adjacent plains from Calgary, Alberta, south through Idaho. East-west range limits were the Black Hills of South Dakota west to Oregon and Washington (Young and Goldman 1944).

Characters of subspecies intergrade with those of adjacent subspecies (Mech 1970). Jolicoeur (1959), in discussing geographical variation in skull dimension, stated: "the overall pattern of variation . . . is more suggestive of an incompletely panmictic continuum than of distinct subspecific units." Therefore, distribution boundaries drawn

on a map should not be considered the absolute limit or extent of a subspecies range. The question of whether or not NRMW is a valid subspecies is not within the scope of this study. For convenience, I will refer to wolves as NRMW. The question of whether wolves that occur in the northern Rocky Mountains are NRMW or animals of another subspecies drifting into the United States from Canada will be discussed.

Previous Studies

A number of wolf studies have been conducted in northern Minnesota, Ontario, northern Canada, and Alaska during the last 10 years. In the Rocky Mountains of Montana, Idaho, Wyoming, southeastern British Columbia, and southern Alberta, no full-scale studies of wolves have been completed. Singer (1975a and b) working in and around Glacier National Park, tried to document wolf occurrence in his study area. The Wolf Ecology Project, under the direction of Dr. Robert Ream, University of Montana, has conducted studies in areas adjacent to Glacier National Park and along the eastern Rocky Mountain front in the years since the field work for this study was completed (Ream and Mattson 1981).

A number of estimates have been made of the status and distribution of the NRMW in recent years. These estimates have generally been made in conjunction with reports on the status of wolves

in North America (Aulerich 1964, Cahalane 1964, Mech and Rausch 1975). Young and Goldman (1944) compiled available facts on wolf distribution and ecology but did not discuss any specific areas in detail. Cowan (1947) studied wolves in the Canadian National Parks of Alberta and British Columbia. A study in the Rocky Mountains was done north of NRMW range by Carbyn (1974) in Jasper National Park.

Estimates of Number and Distribution

Wolves, like other large predators, require large ranges. Through intraspecific conflicts and certain physiological controls on reproductive rates, they keep their own numbers relatively low in comparison to herbivore populations. For example, Jonkel and Smith (1973) estimated subspecies of wolves inhabiting the High Arctic Islands and northeast Greenland to number approximately 450 to 550 animals, a population level it has probably seldom exceeded throughout its existence.

Aulerich (1964) reported wolves absent from Idaho and Wyoming but thought they may be present in and around Glacier National Park in limited numbers. According to him, wolves only rarely occur in southeastern British Columbia and southern Alberta. Mech and Rausch (1975) reported an increase in the occurrence of possible wolf observations in Yellowstone and Glacier National Parks and on various national forests in Idaho and Montana. Theberge (1975) reported that wolves were rare in southern British Columbia and

southern Alberta. Cole (1971) reported a minimum of 10 and possibly 15 wolves in Yellowstone National Park during 1969 and 1970. Singer (1975a) reported at least 10 wolves in northern Glacier National Park during 1973-74 and at least 5 during 1974-75. Weaver (1979), working in and around Yellowstone National Park, concluded that no viable wolf population existed in that area.

Objectives

The general objective of my study is to provide baseline data on the status and distribution of the NRMW or wolves within the historical range of NRMW.

Specific objectives are to:

1) determine the past distribution and relative abundance of NRMW;

2) determine present distribution and relative abundance of NRMW or other wolves now within the historical range of NRMW;

3) determine the components of critical habitat for NRMW; and

4) propose management guidelines to increase wolf populations in suitable areas and, at the same time, reduce possible wolf-man conflicts caused by that increase.

To avoid needless duplication, Yellowstone National Park and adjacent areas of Wyoming, Idaho, and Montana will be covered less completely than the rest of NRMW historical range because Weaver (1979) has documented wolf observations there.

CHAPTER II

HISTORICAL PERSPECTIVE

Members of the Lewis and Clark Expedition were the first white men to record observations of wolves in the northern Rocky Mountains. They were impressed by the number of animals seen every day. Clark wrote:

> For me to mention or give an estimate of the different species of wild animals on this river (Yellowstone) particularly Buffalo, Elk, Antelopes, and Wolves would be incredible.
>
> (DeVoto 1953)

Lewis called wolves "shepherds of the buffalo. . ." and a number of entries in the journals refer to wolves preying on buffalo (Bison bison) (DeVoto 1953). Wolves were, however, a nuisance to the Expedition and to later fur trappers. Food caches were destroyed and game could not be left in the field overnight (DeVoto 1953). In eastern Montana, Lewis made one of the first observations on wolf hunting behavior in the western states:

> Game is still very abundant. . . . The quantity of wolves appear to increase in the same proportion (as that of game); . . . they kill a great number of the Antelopes at this season (April); . . . the wolves take them most generally in attempting to swim the River; . . . they appear to decoy a single (antelope) from a flock, and then pursue it, alternately relieving each other until they take it.
>
> (DeVoto 1953)

Lewis also documented wolf use of carrion resulting from an Indian

"buffalo jump" (DeVoto 1953).

When the Expedition traveled out of the buffalo country of eastern Montana and into mountainous areas of western Montana and Idaho, much less wildlife was reported. As Koch (1941) points out, big game and their associated predators were no doubt there but harder to see and in fewer numbers.

Cox (1832), an early trapper on the upper Columbian Plateau, wrote:

> As (the Flathead Indian) lands are much infested by wolves which destroy the foals, they cannot rear horses in such large numbers as the Nez Perce from whom they are obliged to purchase them annually.

Trappers had little interest in trapping wolves while there were ample numbers of beaver (Castor canadensis). However, by 1860, wolf pelts began to make up a significant proportion of the annual fur take (Curnow 1969).

Settlers arrived in greater numbers when gold was discovered in the mountains of Idaho, Wyoming, and Montana. Men were needed to haul supplies to mining settlements. When winter snows halted transportation of supplies, many men turned to hunting wolves and buffalo. These men were known as "wolfers." From 1860 to 1885, they were an important factor to the economy of the area and to wolves (Curnow 1969). Wolfers operated mainly in Montana because of the large numbers of buffalo and wolves available. These professionals

traveled in large circles killing a buffalo every 3 or 4 miles, saturating the carcass with strychnine, and 1 or 2 days later, they traveled the circles again skinning any wolves found dead (Curnow 1969). Up to 100 wolves were found dead near a single carcass (Stuart 1957). Kit foxes (Vulpes macrotis), swift foxes (Vulpes velox), red foxes (Vulpes vulpes), coyotes (Canis latrans), bobcats (Lynx rufus), and badgers (Taxidea taxus) also were poisoned. Wolfers took pelts of these animals when there was a market for them (Curnow 1969).

Wolfing was a recognized industry in Montana. A United States Government report stated:

> Wolfing . . . being pursued only in winter, . . . gives employment and support to a large number of teamsters, steamboat hands and others who are necessarily idle at this season.
>
> (Ludlow 1876)

In 1865, a large, prime wolf pelt sold for $2.00; by 1873, the price rose to $2.50 (Curnow 1969). A wolfer could average $1000 to $1500 a winter and, in a good winter, make up to $3000 (Ludlow 1876). Curnow (1969) estimated 100,000 wolves per year taken by wolfers in Montana between 1870 and 1877 (this number probably included some coyotes).

Wolves were numerous in Montana during the early 1870's. Buffalo hunting was at its peak. Buffalo hunters reported wolves waiting for the buffalo carcasses to be skinned before moving in to feed on the carrion (Curnow 1969). However, by the 1880's, buffalo

had declined to very low numbers (McHugh 1972). Wolves apparently switched rapidly from buffalo to cattle as their primary food source (Curnow 1969).

To combat livestock losses to wolves, bounty laws were enacted by territorial and state governments. In some instances, state, county, and private bounties were paid on a single wolf. Between 1897 and 1907, Wyoming paid $65,000 in state bounties on wolves alone (Bailey 1907). In Montana, state and territorial governments paid $342,674 in bounties on 80,730 wolves taken from 1883 to 1918 (Curnow 1969).

By the early 1900's, cattlemen were using every means available to exterminate wolves. For example, mange research was started in 1905. The State of Montana paid $15 for every wolf delivered to them alive. These wolves were then infected with mange and released with the hope that they would spread the disease to free-ranging wolves and in that way control wolf numbers. This program failed and was discontinued in 1916 (Curnow 1969). Other methods of exterminating wolves were hunting with dogs and horses, digging out dens and killing the pups, trapping, and poisoning (Bailey 1907).

Yellowstone and Glacier national parks also carried out extensive wolf control operations. Murie (1940) stated that organized predator control was responsible for the elimination of wolves from Yellowstone. Cole (1971) reported 134 wolves killed in Yellowstone

between 1916 and 1926. Predator control, including strychnine posioning, was carried out in Glacier National Park until the early 1930's (Singer 1975a). In 1931, the National Park Service adopted a different policy on predators: "The National Park Service believes that predatory animals have a real place in nature, and that all animal life should be kept inviolate within the parks." (Albright 1931).

Wolves were fairly common in Waterton Lakes National Park and adjacent areas of Alberta at the turn of the century. Wolf packs were known to occur on the eastern edge of the Park, but because of livestock depredations, the wolves were extirpated in 1921 (Cowan 1947). In southern Alberta, wolf numbers declined most rapidly between 1875 and 1915, mainly because of poisoning, trapping, and loss of habitat as more and more land was settled (Stelfox 1969).

The Bureau of Biological Survey assumed responsibility for controlling wolves and other predators on federal lands in 1915 (Curnow 1969). Between 1 July 1915 and 30 June 1941, 24,132 wolves were taken by the Survey from states west of the 100th meridian (Young 1946). Aulerich (1964) attributed the disappearance of wolves from much of Idaho to extermination policies of the Biological Survey. Edson (1956) described 2 predator control men taking "several hundred" wolves in the Caribou National Forest, the Medicine Lodge area, and along the headwaters of the Lemhi River between 1916 and 1920. Aulerich (1964) said the last wolf control work done in Wyoming

was near Lusk and in the Upper Gros Ventre River Drainage in 1923. Certain wolves became adept at preying on cattle and sheep. Old Cripple Foot, "queen wolf of the Belts," was pursued for 12 years and supposedly killed $20,000 worth of livestock in the Belt Mountains of Montana before she was finally killed in 1926 (Curnow 1969). The White Wolf of Stanford (Montana) was credited with killing 10 domestic cows in 7 weeks and was killed in 1930 (Rogeth 1967). The champion rogue may have been "Three Toes of Harding County" (South Dakota) who supposedly killed $50,000 worth of livestock during its lifetime. According to Young and Goldman (1944), it destroyed 66 head of sheep in 2 nights and was finally killed in 1925.

By 1940, very few wolves were left in the western states. Farming and ranching became primary land uses and serious losses to predators were not accepted. Sophisticated methods were developed to deal with predators such as aerial hunting and efficient poisons. Aulerich (1964) stated that any wolves left in the western states probably inhabited wild areas of large national forests.

CHAPTER III

METHODS

Wolf Observation Reports

I initially recognized that wolves are elusive and difficult animals to observe. When the species occurs in low numbers this problem is amplified because of the range and cover available to individual animals. For this reason, I needed many sources of information from a broad area. Reports of wolf observations made by local residents, outfitters, guides, hunters, backpackers, loggers, and state and federal agency personnel were the major source of data. Because almost nothing was known about wolves in the northern Rocky Mountains prior to this study, reports were the best way to obtain preliminary information on the population status of such a rare and elusive animal. Olson (1938), Young and Goldman (1944), Cowan (1947), Carbyn et al. (1975), Hendrickson et al. (1975), Singer (1975a and b), and Weaver (1979) also used this type of information in portions of their wolf studies.

Reports of wolf sightings, signs, and howling are all referred to in this paper as "reports." To determine areas where wolves most probably occurred, I collected, analyzed, and mapped responses

to a letter sent by the Wolf Ecology Project of the University of Montana to interested agencies and individuals requesting information on wolves. I defined a core area as an area where 3 or more reliable wolf observations were made within 1 year.

As core areas were delineated, I went to them and interviewed local agency personnel, ranchers, outfitters, and others in an attempt to uncover other wolf observations. If an observation was within 3 weeks, I went to the specific area and searched for evidence to determine whether the report was reliable.

For use in interviewing, as well as in recording field data, I developed standard forms. One form (Fig. 1) was used for wolf sightings and the other (Fig. 2) for observations of wolf signs. The forms were also used to record presence of large dogs in the area, remoteness of the area at the time of year the observation was made, relative numbers of prey in the area, and the predominant habitat type.

An attempt was made to set up a network of people throughout the study area who would report wolf observations to me immediately. In this way, I hoped to assess the reliability of observations by being in the area as soon after an observation as possible.

Sources of bias. Probably the most critical problem with the use of random wolf observation reports is determining the reliability of observers. Some may honestly believe they see wolves but may be

RETURN TO: Wolf Ecology Project
University of Montana
School of Forestry
Missoula, MT 59801

WOLF SIGHTING

Date:_____ BY: _____
(name)

Time:_____

_____
(address)

Weather Conditions:

_____ _____
(occupation)

Location:_____

_____

Specific habitat type:_____
Number of animals:_____
Size differences in animals:_____

_____

Distance between observer and animals:_____
Behavior of animals:_____

_____

Length of observation:_____
Type of observation:_____
(binoculars, riflescope, etc.)
Circumstances of observation:_____
(riding in car, hiking, etc.)
Reason for observer being in area:_____
Number of observers:_____
Physical characteristics of animals:

1) Color:_____
2) Size:_____
(est. wt. or compare to dog of similar size)
3) Position of tail:_____
4) Track size:_____
5) Any other characteristics which indicate wolf rather than dog or coyote:

_____

_____

Was photograph taken?_____ Where is it?_____
Have you seen wolves before?_____ Where?_____
(wild, zoo, museum, etc.)
Relative nos. of prey (deer, elk, moose, etc.) in area:_____

_____

Number of humans in area:_____
(a lot, a little, etc.)
Straight-line distance to nearest people-occupied area:_____

_____
(ranch, town, road, campground, etc.)

Use reverse for any additional information. All observers include name and address and occupation on back.

_____

Fig. 1. Standard observation form used when recording field data or interviewing someone who has seen a wolf.

RETURN TO: Wolf Ecology Project
University of Montana
School of Forestry
Missoula, MT 59801

WOLF SIGN DATA

By: _____
(name)

_____
(address)

_____
(occupation)

Date_____
Time:_____
Weather Conditions:_____
_____

DEN TRACKS HOWLING SCAT KILL SCENTPOST
(circle appropriate ones)

Location:_____
_____
_____

Habitat type:_____
Minimum nos. of animals indicated by sign:_____ Max. nos._____
Size of tracks:_____ Diameter of scat:_____
Length of pace:_____ Length of howling:_____
Were there evidences of large dogs in area:_____ Closest inhabitant with large dog:_____
(name and address)

Activity of animals indicated by sign:_____
_____

Detailed account of observed sign:_____
_____
_____
_____
_____
_____
_____
_____
_____
(continue on back)

Relative nos. of prey items (deer, elk, moose, etc.) in area:_____
_____

Was photograph taken or picture drawn or cast taken, etc.?_____
If so, who now has it?_____
(name and address)

Total number of observers:_____
Amount of human use in area:_____
(heavy-light)

Straight-line distance to nearest people-occupied area:_____
_____
(ranch, town, road, campground, etc.)

Use reverse for any additional information. All observers include name, address, and occupation on back.

_____

Fig. 2. Standard observation form used to record details of a sign observation.

mistaken. Others may not know the difference between wolves and coyotes. Kaley (1976) stated that the popularity of wolves and the wolf issue may cause people to hastily label an unidentified animal a wolf. There are also those who may deliberately distort the truth, perhaps in order to gain prestige. Some people are competent, qualified observers aware of the problems in making positive identification of such an elusive animal.

Differences in vegetation and topography between areas may also bias the distribution of reports. Compared to an area such as the North Fork of the Flathead River, certain areas on the east side of the Continental Divide afford much higher visibility because of weather, natural vegetational differences, fire history, and topography. For these reasons, wolves (and other wildlife) may be more easily seen in some areas than in others.

Access also plays an important role. The reports collected are an indication of where people report seeing wolves, not necessarily a true indicator of wolf distribution. Most reports are made from trails or roads. Increased recreational use of wilderness areas, national parks, and national forests gives biases to the data. Winter recreational activity, in the form of snowmobiling, snowshoeing, and cross-country skiing has greatly increased during the past 10 years. This increased activity may have significantly influenced track reports and winter sightings.

Singer (1975a), in commenting on the use of random wolf observations to determine population trends and fluctuations, discussed another possible source of bias. Some land management agency personnel, such as park rangers or national forest personnel, take more of an interest in recording reports of wolf observations than do others. Therefore, due to transfers, promotions, and retirements, no systematic or continuous effort has been maintained.

Because I did not spend an equal amount of time in all parts of my study area, I may have biased the distribution of reports also. Therefore, the lack of observations in some areas does not necessarily mean that no wolves are there.

I encountered difficulty in obtaining observational data made more than 2 or 3 years prior to the request. Some people, not understanding that I was interested in anything but their most recent information, biased the temporal distribution of the data.

Wolves are secretive, elusive animals and only under exceptional conditions do observations last for more than a few seconds. Often observations are made at dawn or dusk, or at other times of poor lighting. At long distances, where no comparison of size can be made, wolves could easily be mistaken for coyotes or certain breeds of large dogs. Coyotes are common throughout the northern Rockies. Wolves could be mistaken for coyotes as well as coyotes mistaken for wolves.

Few people recognize and record wolf sign, howling, tracks, and scats, properly. Many backcountry visitors are not aware of such subtle evidences of animals. Others seem to be oriented to specific animals and virtually ignore signs of other animals; elk hunters are a good example of this. Some recognize wolf sign but do not realize the importance of taking measurements, drawing a picture of the track, collecting the scat, photographing the evidence, or making a plaster cast. Consequently sign information as I received it was seldom as complete as it could have been.

Evaluating reports. To counteract the biases listed above, developed a system to grade wolf observation reports. Because the system is based on arbitrary criteria, the grades are arbitrary. However, such a system is necessary and, as long as the limits are recognized, it is valuable. Singer (1975a) also proposed criteria by which degree of confidence could be placed on reports of wolf observations. Weaver (pers. comm.) developed a system to grade reports in Yellowstone National Park by assigning specific values to details of the reports. He placed less emphasis on the observers reliability and background than I have in my system.

Using the grading system, the reports were separated into 4 categories: Very Good, Good, Fair, and Questionable. The criteria used to determine which category a report went into were:

1) observer's credibility within the community;

2) observer's backcountry experience (i.e., did he backpack, fish, hunt, etc.);

3) observer's occupation;

4) observer's experience with wolves and western coyotes;

5) circumstances of the observation (i.e., distance of the animal from the observer; the length of observation; the use of optical aids; the position of the observer, such as riding in a car, in a plane, etc.);

6) details of the observation (i.e., color, shape of head, size, position of tail, track size, pace length, etc.); and

7) correlation of the report with other reports in the area.

Instead of placing numerical values on the observation report, I gave a subjective rating to each report based on how well the report generally met the criteria. Because the criteria are subjective, the grading system has to be subjective. I tried to be as conservative as possible when evaluating reports, however, errors were certainly made. The Questionable category does not necessarily include only reports made by persons of questionable credibility but also includes reports where information was incomplete. I do not pretend to be able to determine a person's credibility; this was mainly decided after talks with neighbors, friends, etc., and by the general believability of the person. I want to make it very clear that no slighting of character is

intended.

Ground Surveys

When a series of high quality reports from a specific area indicated probable wolf activity, a trained assistant or I went to the area and conducted a ground survey to search for tracks and scats and attempted to elicit howling responses. A minimum overall length of 100 mm was used to differentiate wolf tracks from coyote tracks. Weaver and Fritts (pers. comm.) suggested using a scat diameter (measured at the greatest width) of 34 mm to separate wolf from coyote scat. No reliable techniques have been developed to differentiate large dog tracks and scats from those of wolves. However, Harris (pers. comm.) has preliminary indications that large dog prints may differ from wolf prints by the relative size and shape of pads. I believe wolf sign can be separated from dog sign to a certain extent by proximity of the sign to areas occupied by humans, content of scat, association with human tracks, and comparing the sign to that of dogs which inhabit the closest area occupied by humans.

Howling, as a means of locating wolves, was used throughout the study by myself and trained assistants using techniques described by Theberge and Falls (1967) and Harrington (1975). As Singer (1975a) pointed out, many wilderness trails are near mountain streams that make howling inefficient. Sounds of a stream interfere with the

projected howl. Wind noise was also a problem. Therefore, whenever possible, howls were projected from ridges, trails, and roads located away from other noises.

The U.S. Fish and Wildlife Service and Bureau of Land Management provided limited flying time to use in verifying wolf observations. When an area produced several similar observations within a short period of time, a trained assistant or I flew in either a helicopter or a fixed-wing plane over the area looking for wolves or wolf tracks.

Habitat Analyses

Basic wolf habitat requirements were determined through a review of the literature and an analysis of collected reports. The reports were plotted and correlations between their location, big game winter ranges, and the remoteness of the area were determined.

Moose (Alces alces), elk (Cervus elaphus), bighorn sheep (Ovis canadensis), and deer (Odocoileus sp.) winter ranges were mapped using information received from the U.S. Forest Service, Montana Fish, Wildlife and Parks Department, Bureau of Land Management, National Park Service, private individuals, and personal investigations. A special effort was made to obtain information on small, isolated pockets of wintering big game and on elk calving areas.

A "center of activity" was determined from groups of reports,

and the extent of human influence (remoteness analysis) on the surrounding area was assessed. Census figures from 1970 were used to arrive at the population of various cities and villages. The reports collected do not necessarily indicate the areas being used by wolves, rather they indicate where people report seeing wolves. Therefore, my use of the term "center of activity" is not a literal one.

The remoteness analysis describes road and trail systems (in general terms) and point sources of human influence such as mines, resorts, campgrounds, etc. No boundaries for use in making the remoteness analysis were drawn because the effect of human influences varies in different areas. For example, the impact on wolves of a ridgetop road in an open area such as the Tendoy Mountains of southwest Montana would seem to be greater than a similar road in a heavily forested area such as the Whitefish Range of northern Montana.

CHAPTER IV

RESULTS AND DISCUSSION

The following discussion is based on my subjective analyses of wolf reports as described earlier. Despite the discussed limitations, wolf observations were made regularly in certain areas by well qualified individuals. Some areas regularly produced reports that were similar in terms of color and number of animals involved. The reports cannot be used to determine true distribution and actual numbers of wolves in the northern Rockies, but, if used carefully, they can indicate areas where wolves are most likely to occur.

Status and Distribution

Wolf observation reports. From October 1974 to March 1977, 372 reports of possible wolf observations were collected. This number does not include about 130 reports made since 1910 and collected by Singer (1975a and b) and Kaley (1976) in the Glacier National Park area. As of March 1977, Weaver (pers. comm.) had collected and analyzed 488 reports from the Yellowstone National Park area. Also, approximately 30 reports, mainly from southeastern Idaho, have not been analyzed and are not included. Of the 372 reports, 93 were given a Questionable rating and will not be used.

Included in the Very Good category are 5 reports of wolves killed during 1964, 1968, 1972, 1974, and 1977. The only positive method of identifying a wolf is to examine its cleaned skull. Of 5 wolves reportedly killed, 3 were examined and determined to be wolves. Skulls of the other 2 were not available, however, the pelt of 1 and the carcass (minus the head) of the other were examined and they were probably wolves also.

Wolf reports included sightings, tracks, scats and dens seen, and howlings. Most of the reports involved sightings (Table 1). Because wolves are rarely seen, even in areas where wolf density is high, I had hypothesized that more reports would be of tracks than of sightings. However, as indicated earlier, many people apparently do not recognize sign or it does not make the impression a sighting does.

Most reports were made within the last 10 years (Table 2); 261 of the 279 reports took place from 1967 to early 1977. People apparently remember details of more recent observations and are more apt to report them. Historical trends in population size therefore cannot be determined from these data. Sharp increases for specific township groups shown in Table 2 can be explained by the increased amount of time spent in an area by Wolf Ecology Project personnel after the onset of reports.

By grouping reports according to their north-south location as shown in Fig. 3, 2 clumpings of observations became apparent. The

Table 1. Number of wolf observation reports (arranged by township clumping) in which each type of observation was made.

Area[1]	Sightings	Howling	Tracks	Scats	Den	Combination	Dead wolf	Totals
T33N - T37N	28	4	18	1	0	0	2	53
T28N - T32N	33	4	20	0	0	1	0	58
T23N - T27N	17	2	20	0	0	1	1	41
T18N - T22N	14	2	5	0	1	1	1	24
T13N - T17N	10	0	4	0	0	1	0	15
T8N - T12N	0	0	2	0	0	0	0	2
T3N - T7N	0	0	0	0	0	0	0	0
T3S - T2N	0	1	1	0	0	0	0	2
T8S - T4S	16	5	3	0	0	2	0	26
T13S - T9S	25	4	8	0	0	0	0	37
T18S - T14S	11	1	8	0	0	1	0	21
Totals	154	23	89	1	1	7	4	279

[1]Township "strips" were used to group reports, e.g., T33N - T37N indicates reports from a horizontal strip across Montana 5 townships (approximately 96 km) wide.

Table 2. Number of wolf observation reports (arranged by township clumping) made from 1967 through early 1977.

Area[1]	1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967
T33N - T37N	8	18	6	6	5	2	1	2	3	1	1
T28N - T32N	4	17	14	5	1	5	2	0	1	2	1
T23N - T27N	0	12	6	9	5	2	0	0	0	1	0
T18N - T22N	0	7	4	1	5	2	0	0	0	0	0
T13N - T17N	0	4	8	1	1	0	1	0	0	0	0
T8N - T12N	0	1	1	0	0	0	0	0	0	0	0
T3N - T7N	0	0	0	0	0	0	0	0	0	0	0
T3S - T2N	0	1	1	0	0	0	0	0	0	0	0
T8S - T4S	0	7	7	6	2	3	0	1	0	0	0
T13S - T9S	0	7	5	8	5	2	6	1	1	1	0
T18S - T14S	1	3	11	3	2	0	0	1	0	0	0
Totals	13	77	63	39	26	16	10	5	5	5	2

[1]Township "strips" were used to group reports, e.g., T33N - T37N indicates reports from a horizontal strip across Montana 5 townships (approximately 96 km) wide.

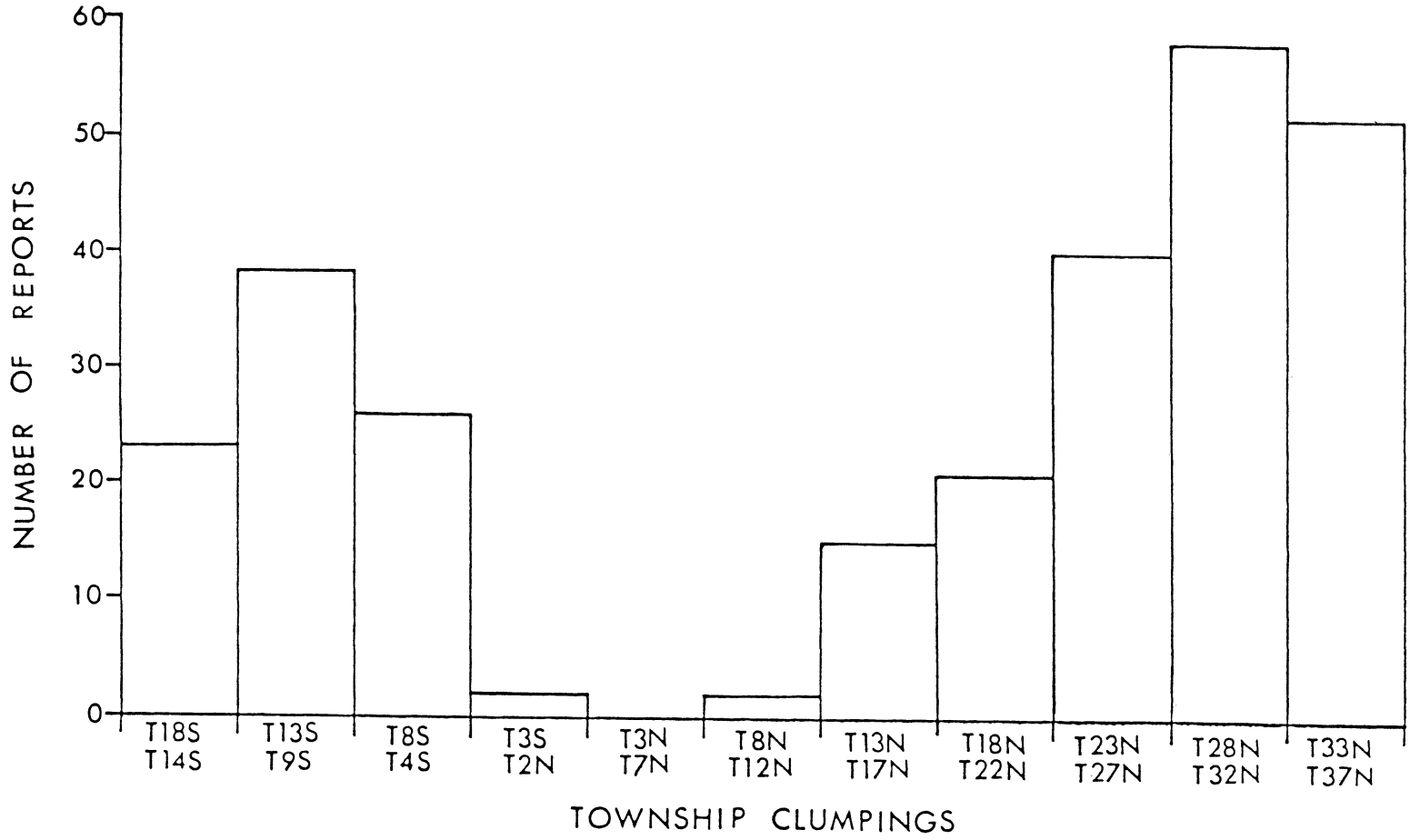

Fig. 3. North-south distribution of wolf reports.

northern-most grouping centers around the Bob Marshall-Scapegoat Wilderness area, Glacier National Park, and the Kootenai National Forest. The southern group includes observations from most of the Beaverhead National Forest, parts of the Gallatin National Forest, and into Idaho on the Salmon and Targhee national forests. A 50-km strip where I was not able to collect any wolf observation reports separates the 2 groups of observations. A 145-km strip separating the north-south groups contains only 5 reports (Fig. 3).

To discuss the reports more completely, I have divided the study area into 9 smaller areas. Boundaries for these areas are arbitrary and wolves could move between adjacent areas. However, boundaries are based on groupings of similar observations and should not be dismissed entirely. In discussing present populations, only reports from 1974 to early 1977 are used. Complete details of all reports are contained in Appendix A.

Northeast Glacier area. Data from northeast Glacier National Park and the adjacent Blackfeet Indian Reservation are summarized in Table 3. Fig. 4 shows area boundaries and locations of observations since 1974. Observations of wolves have been made since 1910 according to Singer (1975a). Reports I collected ranged from 1969 to 1977. Because Singer (1975a) had collected historical observations, I made no attempt to duplicate his efforts.

Table 3. Summary of reports from the northeast Glacier area, 1974 through early 1977.

Number	Observer	Date	Group size	Description
1	Shea	6/26/74	1	Tracks
2	Armstrong	9/29/75	1	Black wolf
3	Fisher	10/26 or 27/76	1	Dark-colored wolf
4	Kortge	3/30 or 31/76	1	Tracks
5	Kortge	4/2/76	1	Tracks
6	Reese	6/20/76	1	Wolf
7	Bridegroom	8/15/76	1	Gray-brown wolf
8	Bridegroom	8/25/76	1	Gray-brown wolf
9	Hall	9/76	1	Black wolf
10	Pentilla	10/10/76	1	Grayish-black wolf, photographed
11	Brady	12/6/76	1	"Very black" wolf
12	Pentilla	12/25/76	1	Tracks
13	Hall	1/77	1	Black wolf
14	Burns	1/77	1	Tracks
15	Pentilla	1/6/77	1	Tracks
16	Frauson	1/7/77	1	Dark-colored wolf
17	Burns	1/22/77	1	Trapped black wolf
18	Pentilla	1/25/77	1	Tracks
19	John	3/31/77	1	"Real dark" wolf

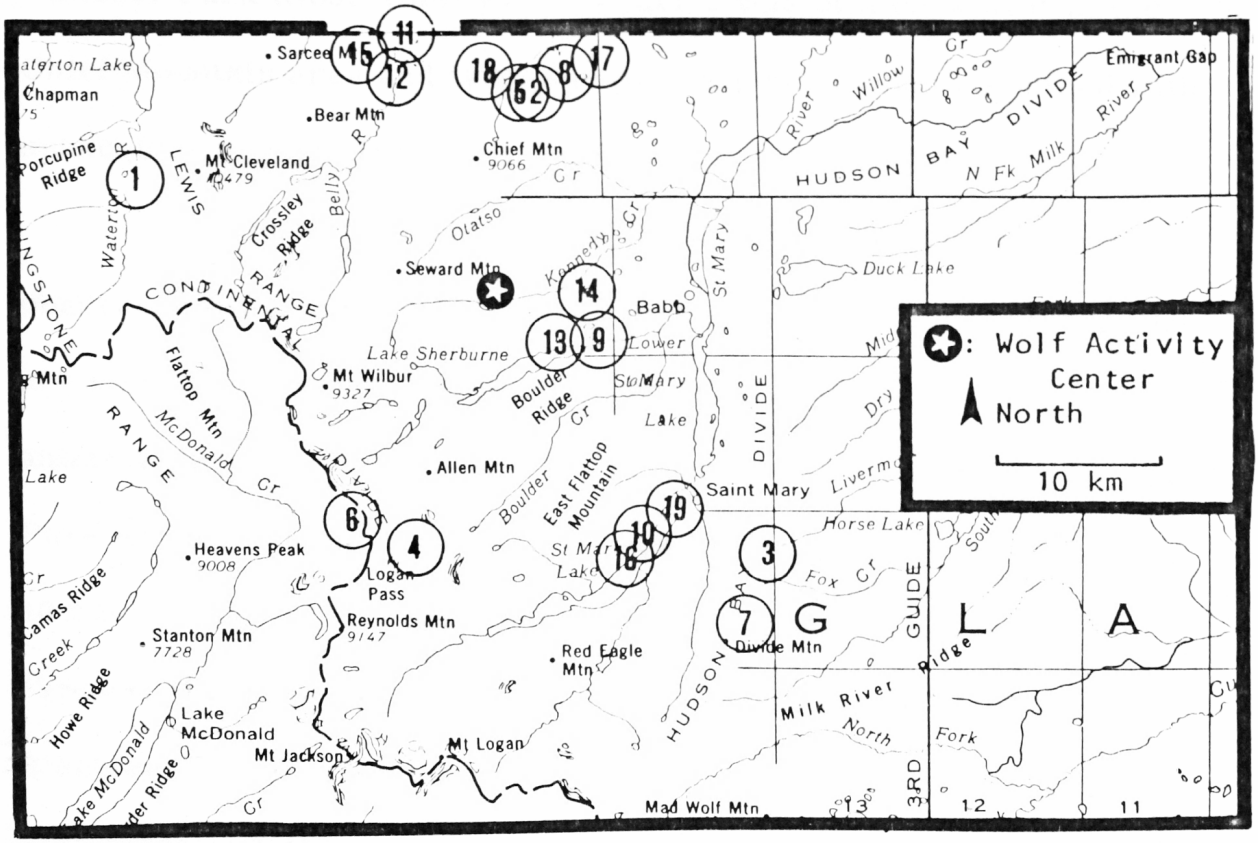

Fig. 4. Northeast Glacier area boundaries and location of wolf observations from 1974 to present.

Compared to 1976 and early 1977 reports, those from 1974 and 1975 were sparse although significant. One report from 1974 and 1 from 1975 were collected from the northern region of Glacier National Park (Nos. 1 and 2). Number 2 was of a dark wolf in the Chief Mountain area and is especially important when combined with subsequent reports from that area.

Ten reports made in 1976 were of single animals that all observers described as being dark or black. Numbers 3 through 19 are similar; however, certain details indicate at least 2 different animals were involved. Number 15, observed by Terry Pentilla, a Park employee with a degree in wildlife biology, is approximately 40 km north of an observation (No. 16) made the following day by Frauson (Park Ranger) and Harris (Park Naturalist). Ted Burns, a Blackfeet Tribal member, trapped and killed a black wolf (skull not examined) near the extreme northeast corner of Glacier National Park. Three days later, Pentilla found fresh wolf tracks in the same area (No. 18). Pentilla examined the pelt of the wolf trapped by Burns and does not believe it was the same animal he observed and photographed the previous October (No. 10). Also, after Burns trapped the wolf, a "real dark" wolf was seen on the ice of upper St. Mary Lake (No. 19).

Numbers 5, 8, 11, 12, 15, 17, and 18 are from a specific area along the Chief Mountain Highway and are of a black or gray-brown wolf. The majority of these reports are from winter, perhaps because

of the elk winter range located along the Belly River. Numbers 9, 13, and 14 seem closely associated with those of the Chief Mountain Highway and may indicate the location of travel routes. Numbers 10, 16, and 19 are winter observations clumped around elk and deer wintering areas near Saint Mary.

The observation reports indicate that a dark-colored wolf may range somewhere between Hudson Bay Divide and Waterton Lakes National Park.

Deer and elk are numerous in the vicinity of St. Mary Lake and along the foothills to Lake Sherburne. Swiftcurrent Ridge has high numbers of moose. The Belly River Drainage maintains a small population of elk that usually winter in the vicinity of Chief Mountain Customs Station. Data are too limited to determine travel routes; however, natural crossing areas near Sherburne Dam and Swiftcurrent Ridge below Yellow Mountain may be used. An important winter travel route may be from the north side of upper St. Mary Lake along the foothills to Lake Sherburne.

Reports from 1969 to 1974 indicate that areas around Duck Lake may also be used by wolves. The Hudson Bay Divide, which runs adjacent to Duck Lake, could be important to wolves because it provides a fairly wild route from Duck Lake to Glacier National Park while avoiding the towns of Babb and Saint Mary.

Wolf reports were most numerous in the Chief Mountain-Belly

River area during the 1974 to 1977 period. Any wolves present in this area could easily travel northward into Alberta or southward along the Park boundary. For these reasons, I placed the wolf activity center in this area as south of Chief Mountain (Fig. 4).

Human use of the region around the activity center varies from high density recreational use in summer to low resident use in late fall, winter, and spring. U.S. Highway 89 parallels the Park boundary and is open all year. Montana State Highway 17 (Chief Mountain Road) is usually closed to winter motor traffic. A number of people maintain permanent residences in the Duck Lake area. Babb, population 52, and Saint Mary, population 30, are major towns in the area. No winter motor traffic was allowed in Glacier National Park from 1974 to 1977. Tribal lands adjacent to the Park are grazed under permit lease with resultant herder and administrative activity. The nearest large population centers are East Glacier Park (pop. 300), Browning (pop. 1700), and Cardston, Alberta (pop. 2685).

Northwest Glacier area. I spent little time in this area because Singer (1975a) and Kaley (1976) had already gathered the observational data available on wolves there. Singer (1975a) collected approximately 77 wolf observation reports made from 1910 to 1975. About 24 of the reports were made since 1960. Kaley (1976) collected about 11 wolf observation reports made from spring 1975 through

April 1976. I collected 12 reports made from 1975 to 1977 (Table 4). Eleven of those reports were of single animals, 1 howling report was of 2 to 5 animals.

Table 4. Summary of reports from the northwest Glacier area, 1974 through early 1977.

Number	Observer	Date	Group size	Description
1	Jammy	3/75	2-5	Howling heard
2	Jammy	5/75	1	Dark grayish brown
3	DeSanto	5/22/75	1	Light colored
4	Jammy	8/75	1	Dark grayish brown
5	Young	9/25/76	1	Tracks
6	Gaffney	Fall/75	1	Dark
7	Grossweiler	5/17/76	1	Gray
8	Mace	6/20/76	1	Light gray
9	Waldt	9/25/76	1	Scat found
10	Waldt	10/9/76	1	Howling
11	DeSanto	12/17/76	1	Tracks
12	Daneke	2/13/77	1	Tracks

Fig. 5 shows area boundaries and the location of reports collected since 1974. Appendix A contains details of all reports collected. Three sighting reports were of dark gray wolves (Nos. 2, 4,

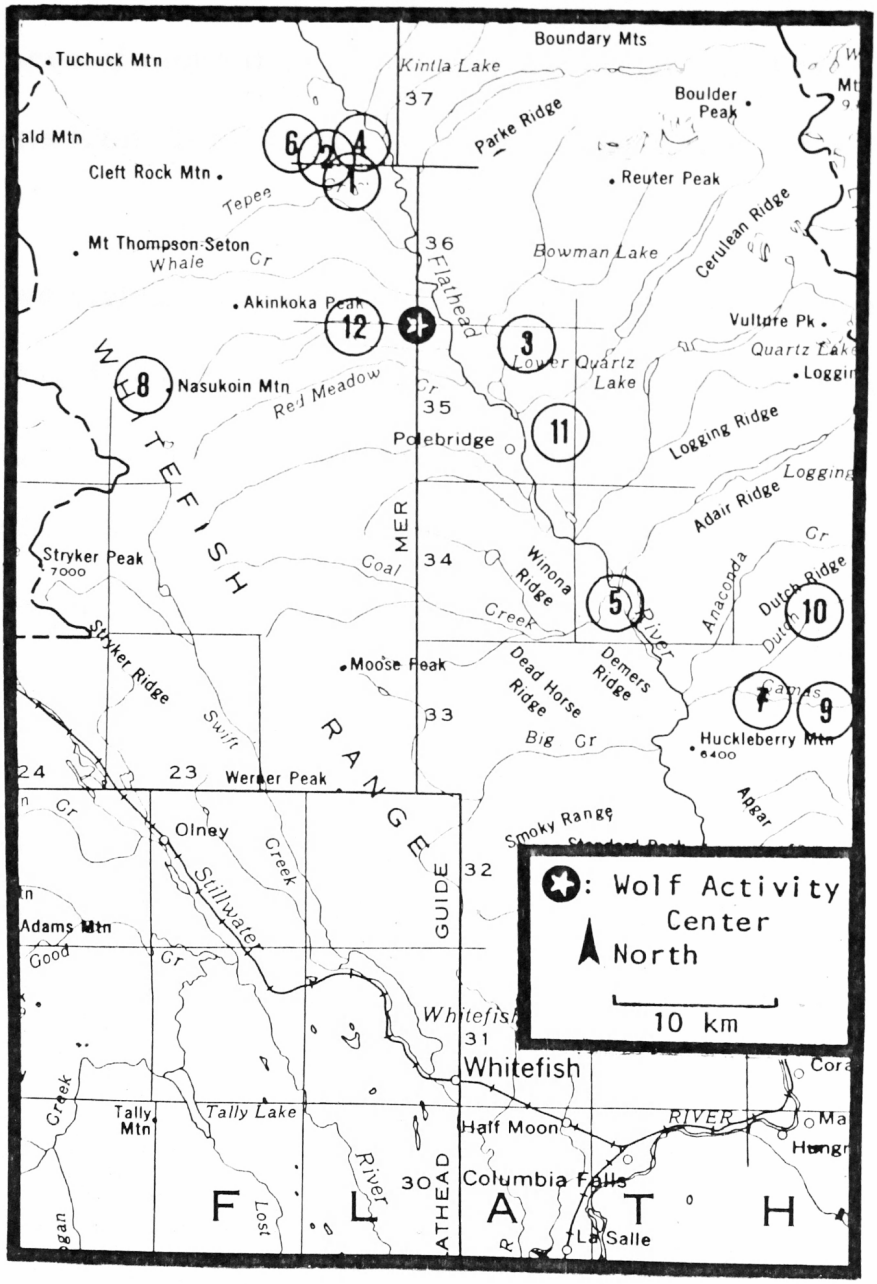

Fig. 5. Northwest Glacier area boundaries and location of wolf observations from 1974 to present.

and 6). These reports all came from residents of the Trail Creek Road and all were of single animals. The only observation I collected from this area of more than 1 wolf was also from the Trail Creek Road. Observations from Trail Creek occurred from March 1975 through fall 1975.

Two sighting reports were of a single light-gray wolf (Nos. 3 and 8). Jerry DeSanto, Glacier National Park Subdistrict Ranger at Polebridge, and 2 other Park employees saw a light-colored wolf on 22 May 1975. On 6 June 1976, a Border Grizzly Project employee reported seeing a light-gray wolf about 24 km west of DeSanto's observation. A gray-colored wolf was reported on the Camas Creek Road on 17 May 1976 (No. 7). Report Numbers 5, 9, and 10 are also from the Camas Creek area.

Singer (1975a) reported a minimum of 5 wolves (1 pair and 3 singles) present along the North Fork of the Flathead River in 1974-1975. He estimated an area 57 km long and 49 km wide used regularly by the resident wolves. Singer (1975a) reported locating travel routes and activity centers where breeding and some digging occurred in February and March 1975.

Kaley (1976) stated that wolves occurred in the North Fork area but were not resident. He described wolf use of Park areas as greatest in fall and early spring and believed the Whitefish Range and the Wigwam River area of British Columbia were the main use areas. He

did not estimate population size, but mentioned that wolf observation reports had increased during 1975-76.

Martinka (1976a) estimated a total wolf population in Glacier National Park of 10-20 animals. He believed the northwest Glacier Park area held the most potential for maintaining wolves of any area adjacent to the Park.

Singer (1975a) described elk, mule deer, and white-tailed deer populations in the North Fork valley. He reported a minimum of 491 white-tailed deer distributed throughout the lower elevations during all seasons except winter. In winter, they were excluded from the upper North Fork Drainage but were widely distributed along the lower North Fork. Mule deer were more widely distributed than white-tailed deer but were clumped during winter. Minimum elk numbers were 420 and were quite widely distributed. Moose were distributed throughout the North Fork (Singer 1975a).

I placed the wolf activity center north of Polebridge (Fig. 5). Reports are more numerous in the upper North Fork even though fewer people use (and hence report wolves in) that area. Polebridge (pop. approx. 10) is the only commercial center in the area. A maintained gravel road runs the entire length of the North Fork. Parts of the Whitefish Range have been heavily logged and roaded. These roads are generally not open in winter and do not seem to appreciably increase access to the area at that time of year.

The adjacent region of British Columbia is relatively uninhabited and may serve as a reservoir supplying wolves to this area. However, extensive coal fields have been discovered in the Cabin Creek Drainage (approximately 7 km north of the International Boundary) and, if developed, they may change the character of the entire North Fork.

Kootenai area. I spent very little time in the Kootenai area. However, William Ruediger (pers. comm.), former wildlife biologist on the Kootenai National Forest, collected wolf observations and reported them to me. Based primarily on Ruediger's reports, 10 possible wolf observations were made between 1974 and 1977 (Figs. 6 and 7, and Table 5). Details of a wolf trapped in 1972 are also presented. A number of earlier observations of wolves were also made. Details of all reports are contained in Appendix A.

The skull of the trapped wolf listed as No. 1 was never examined. However, experts examined the pelt and agreed it probably was that of a wolf (Mech pers. comm.). Numbers 2 through 5 are from the Yaak River drainages and the Northwest Peak area, and all occurred in 1974. Subsequent wolf observations have not been reported from those areas. Report Numbers 6 and 7 were also made in 1974, but seem to correlate better with reports shown in Fig. 6 than those in Fig. 7.

Report Numbers 8 through 11 (Fig. 7) include accounts of both

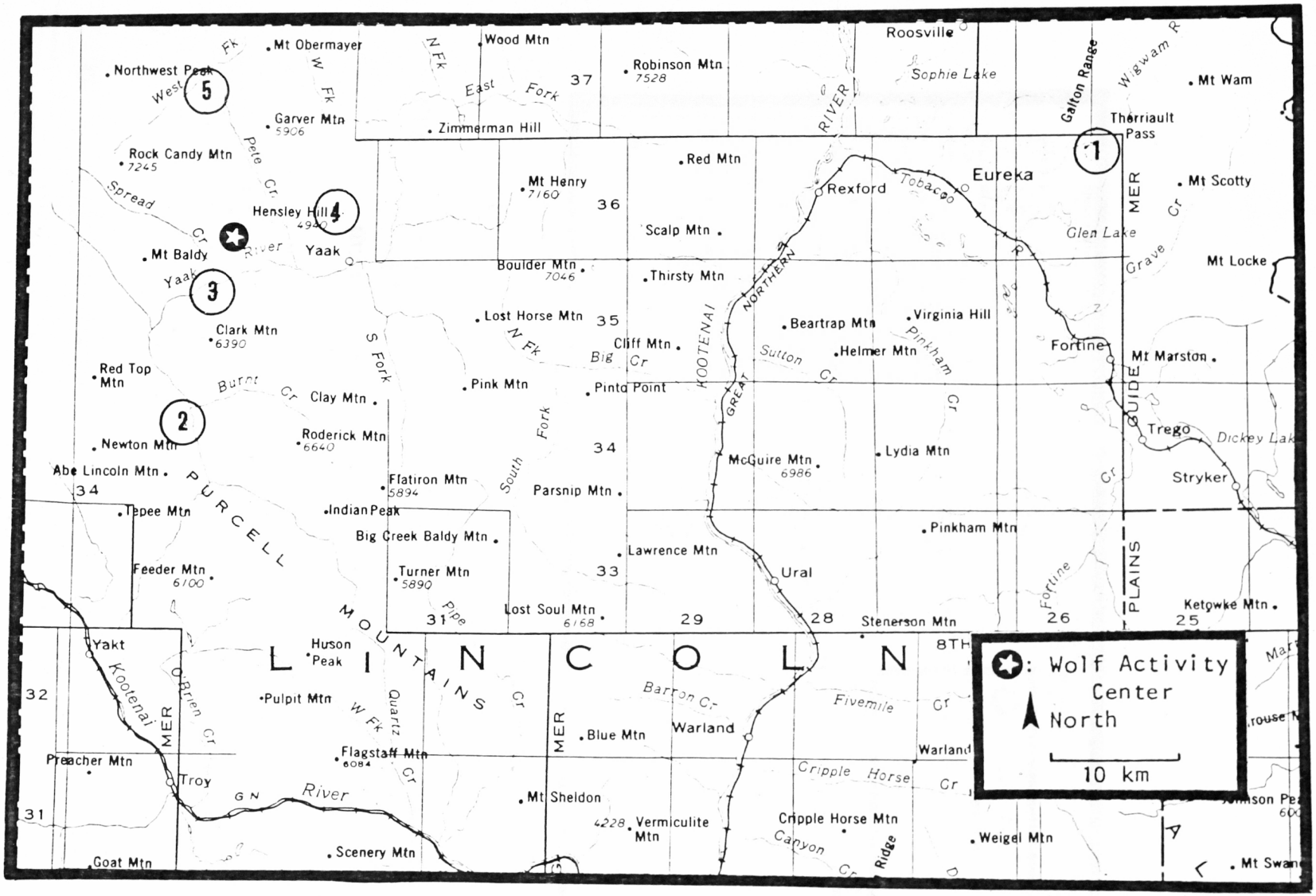

Fig. 6. A portion of the Kootenai area showing boundaries and location of wolf observations from 1974 to present (see also Fig. 7).

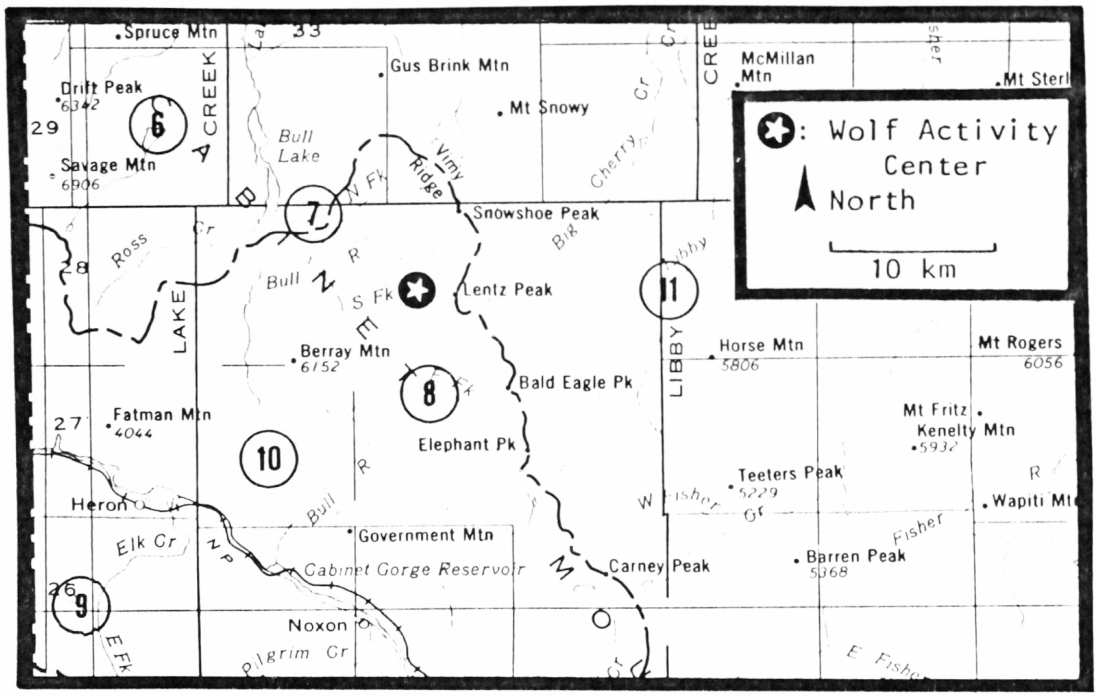

Fig. 7. A portion of the Kootenai area showing boundaries and location of wolf observations from 1974 to present (see also Fig. 6).

gray and black wolves and may be of the same animals. Number 11 is probably more closely associated with reports made in 1976 from the Thompson River area (Fig. 8) than with those from the Kootenai area.

Table 5. Summary of reports from the Kootenai area, 1974 through early 1977.

Number	Observer	Date	Group size	Description
1	Burk	1/74	1	Trapped wolf
2	Dillon	Winter/74	1	Saw wolf
3	McNulty	3/74	1	Tracks seen
4	Norris	4/1/74	1	Tracks seen
5	Lowman	11/74	2	Heard howling
6	Sells	Spring/74	2	Tracks seen
7	Hanley	Fall/74	1	Gray-colored wolf seen
8	Shreckenjoust	3/76	1	Tracks seen
9	Fitchett	10/25/76	1	Tracks seen
10	Noirot	12/76	2	Both gray colored
11	Rhodes	2/77	1	Black wolf seen

Reports from the Kootenai region do not appear to be as consistent as those elsewhere. Perhaps this is because I did not spend a great deal of time actively searching for them. Flath (pers. comm.), leader of the NRMW Recovery Team, believes that wolves do travel

through the area at various times, thus accounting for the scattered observations.

Even though data are limited, 2 wolf activity centers were determined. One center was located near Mt. Baldy (Fig. 6) and one west of Lentz Peak (Fig. 7). The Kootenai area has high numbers of white-tailed deer and some elk. The area around Northwest Peak and Rock Candy Mountain is relatively unroaded and supports many deer and some elk. Big game winter along the larger river bottoms. Areas around Bull Lake and along the Bull River may provide important winter prey concentrations for wolves.

Thompson River area. I collected 7 wolf observation reports from the Thompson River area (Fig. 8 and Table 6). Four reports (Nos. 4 through 7) were of a single very dark gray or black wolf made from 6 April 1976 to mid-November 1976 (Table 6). On 6 April 1976, a "very dark, black" wolf was seen near Middle Thompson Lake (No. 4). Two days later, I went there to verify the observation. I found probable wolf tracks measuring 125 mm in length on an abandoned logging road adjacent to Metcalf's property. An assistant and I searched for additional sign and attempted to elicit howling for a total of 5 man-days. No further evidence was found. On 16 May 1976, a "quite large, dark, charcoal-color wolf" was seen crossing the road near Haskill Pass (No. 5) about 32 km northeast of the April 6 (No. 4)

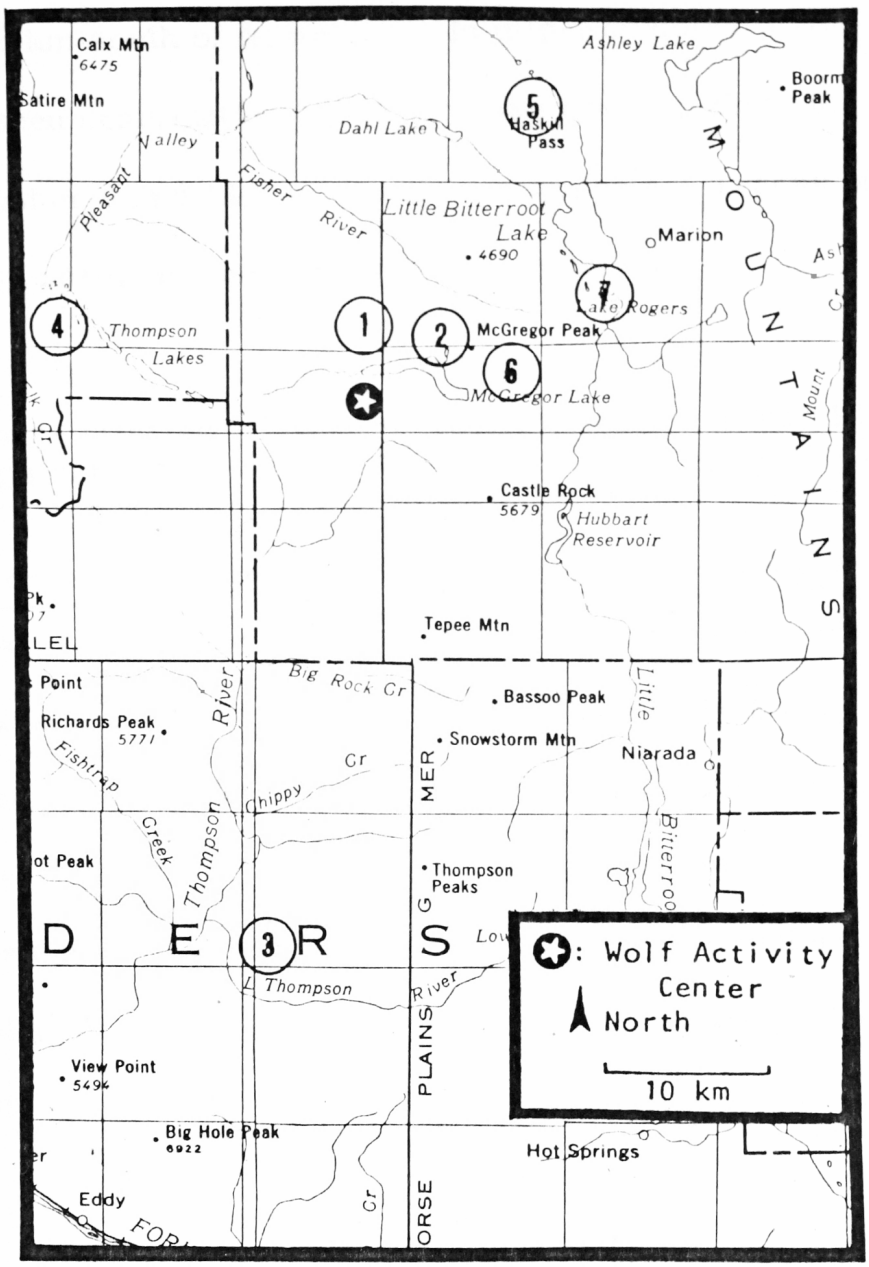

Fig. 8. The Thompson River area boundaries and location of wolf observations from 1974 to present.

location. During spring 1976, a large, dark wolf-like animal was seen in a wet meadow east of McGregor Lake (No. 6) about 29 km east of Number 4 and 16 km south of Number 5. In mid-November 1976, a black wolf was seen near Little McGregor Lake (No. 7), about 6.5 km northwest of Number 6 and 14.5 km south of Number 4. Tracks of this animal were also seen, but no measurements were taken.

Table 6. Summary of reports from the Thompson River area, 1974 through early 1977.

Number	Observer	Date	Group size	Description
1	Monk	Winter/74	2	Dark gray colored
2	Lockrem	9/11/74	1	Gray to dark gray
3	Axtell	4/4/76	1	Light-colored wolf
4	Metcalf	4/6/76	1	Black wolf
5	Harrington	5/16/76	1	"Charcoal-colored" wolf
6	Snyder	Spring/76	1	Dark colored
7	Greig	11/76	1	Black wolf

On 4 April 1976, a light-colored wolf was reportedly seen near Little Thompson River (No. 3) while the observer was watching deer feeding in a meadow.

Evidence indicates that at least 1 dark-colored wolf ranges in this area at various times. Wintering white-tailed deer concentrate

near Thompson Lakes, along upper Thompson River, in Pleasant Valley, and around Little Bitterroot Lake. Mule deer winter along the Little Thompson River. All of these deer wintering areas may be important to wolves occurring in or traveling through this area.

I placed the Thompson River wolf activity center west of McGregor Lake (Fig. 8). U.S. Highway 2, the major east-west highway in northern Montana, runs along Thompson Lakes and McGregor Lake. A number of permanent dwellings occur along this Highway. A maintained gravel road follows the Thompson River from Thompson Falls (pop. 1356) to Highway 2. A number of ranches are located in Pleasant Valley and near Dahl Lake. Fairly extensive logging and resultant roading has occurred in the Thompson River Drainage. The nearest large population centers are Libby, 75 km northwest, and Kalispell, 70 km east. During winter, this area is quite remote, but in summer and fall it is fairly heavily traveled by fishermen, hunters, and campers.

Badger Creek-Highway 2 area. I collected 46 wolf reports made between 1974 and early 1977 from this area (Fig. 9 and Table 7).

Eight wolf observations made in 1974 were reported. Two reports (Nos. 1 and 2) were of a pair of wolves, 1 dark gray and the other whitish. Numbers 3 and 4 involve observations of 3 or 4 wolves. Bill Rappold observed what he believed were an adult and 3 pups a

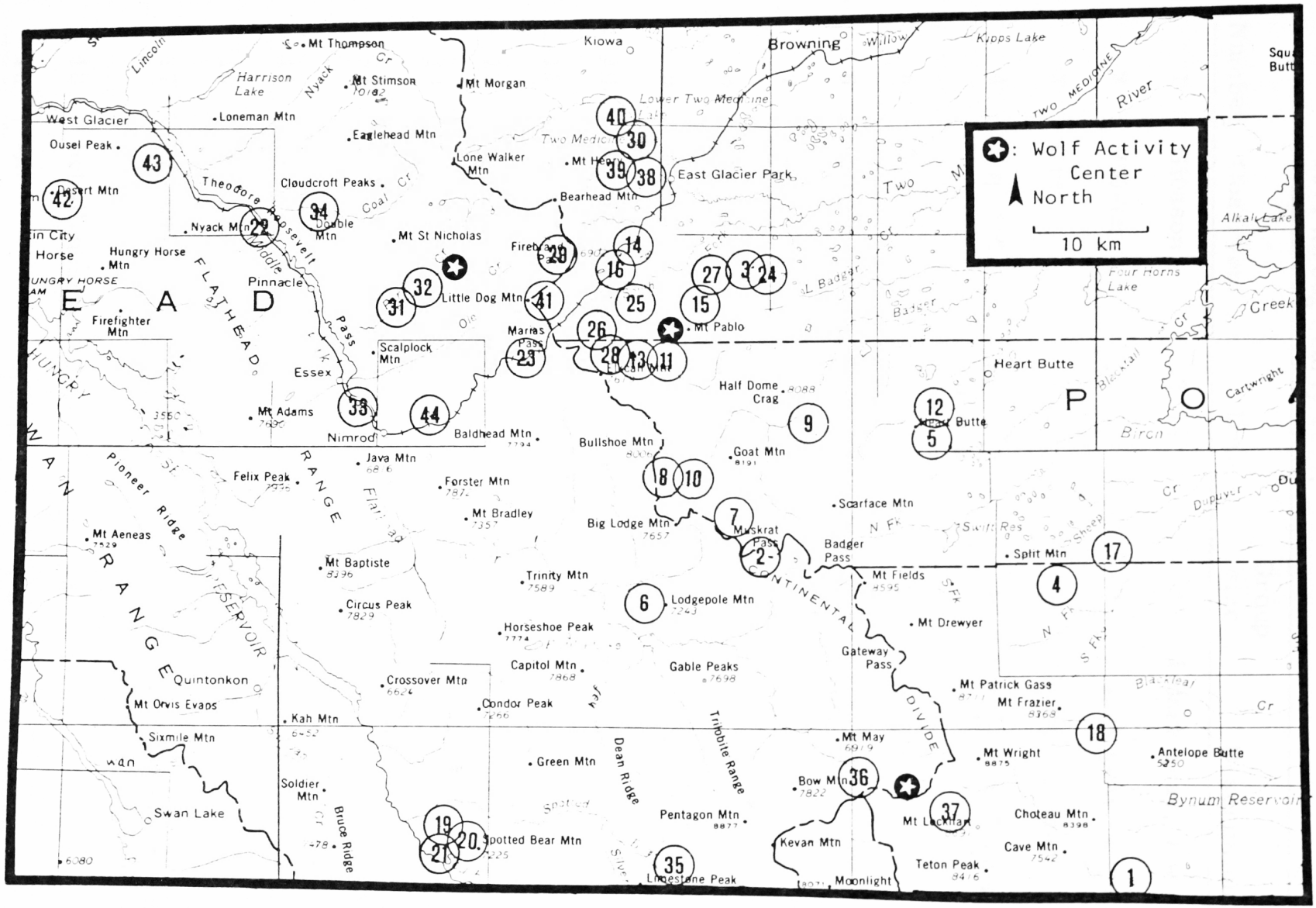

Fig. 9. The Badger Creek-Highway 2 area boundaries and location of wolf observations from 1974 to present.

Table 7. Summary of reports from the Badger Creek-Highway 2 area, 1974 through early 1977.

Number	Observer	Date	Group size	Description
1	Gleason	12/74	2	1 dark gray, 1 whitish
2	Wilson	4/74	2	1 dark gray, 1 whitish
3	Orr	6/74	3	All light colored
4	Rappold	Spring and summer/74	4	1 adult and 3 pups
5	Orr	Summer/74	1	Dark gray
6	Garrow	Fall/74	1	Dark gray
7	Downs	1/75	1	Tracks
8	Downs	2/75	1	Tracks
9	Mills	7/11/75	1	Tracks
10	Schallenberger	7/23/75	1	Tracks
11	Schallenberger	8/12/75	1	Tracks
12	Orr	10/10/75	1	Light-colored wolf
13	Gallup	10/21/75	2	Tracks
14	Schallenberger	11/13/75	1	"Very light, yellow gray"
15	Schallenberger	11/21/75	1	Tracks
16	Emrick	11/30/75	1	Light gray wolf
17	Mathews	Spring/75	3	Thought they were male, female, and pup
18	Schallenberger	6/6/75	3	Tracks
19	On	7/2/75	4-5	Heard howling

Table 7 (continued).

Number	Observer	Date	Group size	Description
20	On	7/3/75	1	Tracks (128 mm X 81 mm) seen
21	Martinson	11/13/75	1	Tracks (125 mm X 100 mm) seen
22	Harris	12/75	3	All gray-colored wolves
23	Ripley	2/76	1	"Light, almost white" wolf
24	Orr	6/76	1	Light-colored wolf
25	Schallenberger	6/18/76	1	Tracks (125 mm X 100 mm)
26	Horak	6/27/76	2	Larger 1 gray, smaller 1 darker
27	Orr	7/5/76	1	Dark gray wolf
28	Keller	7/17/76	1	Light-colored wolf
29	Mattson	7/17/76	1	Tracks
30	Salois	11/76	3	All dark gray
31	Seibert	7/5/76	1	Tracks (100 mm X 87.5 mm)
32	Seibert	7/14/76	1	Tracks (100 mm X 87.5 mm)
33	Keller	7/23/76	1	Dark gray wolf
34	Seibert	8/30/76	1	Tracks (110 mm X 96.8 mm)
35	Werner	7/3/76	1	Rear tracks (93.8 mm X 75 mm without claws)

Table 7 (continued).

Number	Observer	Date	Group size	Description
36	Werner	7/8/76	1	Front track (112.5 mm X 87.5 mm without claws)
37	Johnson	7/9/76	1	Tracks
38	Salois	1/77	1	Howling heard
39	Wuerthner	2/2/77	2	Tracks (125 mm X 106 mm) Seen and followed
40	Salois	2/77	1	Howling heard
41	Wedums	4/2/77	1	Fairly dark-colored wolf
42	O'Neil	6/1/77	1	Light gray-colored wolf
43	Sholer	10/75	1	Heard howling
44	Rohde	12/74	1	Wolf

number of times near his ranch during spring and early summer of 1974 (No. 4). Other reports from 1974 do not seem interrelated.

Seventeen wolf observations made in 1975 were reported (Nos. 7 through 22 and 43). Eleven of these were from the Badger Creek-Two Medicine River drainages. Numbers 7 and 8 were made within 10 km of each other by the same observer. The following summer and fall, tracks of a single wolf were seen 4 times and a single light-colored wolf was seen 3 times in the Badger Creek-Two Medicine River drainages (Nos. 9 through 12 and 14 through 16). Ray Mills, a USFS employee with extensive experience in the backcountry, and Allen Schallenberger, who holds a Master of Science degree in Wildlife Management and also has extensive backcountry experience, were involved in 5 (Nos. 9, 10, 11, 14, and 15) of the reports. Schallenberger's sighting of a "very light yellow gray" wolf on 13 November 1975 (No. 14) is one of the better reports I collected.

At various times during late winter and spring 1975, Allen Mathews, a Montana Fish, Wildlife and Parks Department game warden, saw what he believed to be 3 different wolves east of Split Mountain (No. 17). On 6 June 1975, Schallenberger observed tracks of 3 wolves (No. 18) in the vicinity of Cow Creek approximately 14.5 km south of Split Mountain.

On the west side of the Continental Divide, Danny On, a noted wildlife photographer and USFS employee, John Baglien, USFS wildlife

biologist, and 4 USFS seasonal employees heard wolf howling near Spotted Bear Lake (No. 19). On and Baglien (both familiar with wolf howling) estimated that 4 or 5 wolves were involved. On "howled" back at them and the wolves approached to within 0.4 km. The following day (3 July 1975), On found a single track measuring 128 mm by 81 mm in the same area (No. 20). On 13 November 1975, Al Martinson, also a USFS career employee, found wolf tracks measuring 125 mm by 100 mm near Spotted Bear Lake (No. 21). In December 1975, Ralph Harris, Glacier National Park district naturalist, saw 3 gray-colored wolves cross Highway 2 near Stanton Creek (No. 22).

Eighteen wolf observations made in 1976 were reported. Seven were from the Badger Creek-Two Medicine River area. Report Number 23 of a "light, almost white" wolf seen in February 1976 correlates well with Schallenberger's sighting of a "very light yellow gray" wolf 2 to 3 months earlier (No. 14). Another report of a light-colored wolf (No. 24) was made during early June 1976. Report Numbers 25, 26, and 28 were made within 1 month and 10 km of each other. Schallenberger made another record of a wolf track for this site, the track measuring 125 mm by 100 mm (No. 25). Nine days later, USFS employees saw 2 wolves (No. 26). About 2 weeks later, a camper saw a light-colored wolf (No. 28) approximately 3 to 4 km south of Number 26.

Five wolf reports made during July and August 1976 came

from the portion of Glacier National Park included in this area (Nos. 29, 31, 32, 33, and 34). All involved single animals and all but 1 (No. 33) were of tracks.

Five reports were made in the southeast corner of the Park and northwest of East Glacier Park during late 1976 and early 1977 (Nos. 30 and 38 through 41). Three wolves were involved in Number 30 and 2 in Number 39. These reports correlate well with reports from the south (across Highway 2) and west.

Singer (1975b) discussed wolves in the vicinity of Highway 2 in conjunction with a study on a number of other species of wildlife. He suggested that wolves avoid the Highway corridor and are resident instead in more inaccessible areas. Singer also suggested that the Geifer Creek-Fielding Pass area may be an important crossing area between Glacier National Park and the Middle Fork of the Flathead River area. I believe Stanton Creek and a specific area between Marias Pass and East Glacier are also important travel routes.

Certain areas within the Badger Creek-Highway 2 area appear to be important to wolves. The area from Two Medicine Lake south to Swift Reservoir has excellent reports of 1 to 2 wolves. Firebrand Pass and Ole Creek may form an important travel route in Glacier National Park. Scoffin Butte, east of Swift Reservoir, may be a denning area. Another area that may be important to wolves is bounded roughly by Hungry Horse Reservoir on the west, Highway 2 to

the north, and the Continental Divide on the east. In 1975, reports by well-qualified people were made of 3 to 5 wolves in this area. However, in 1976, reports from this site were only of single animals.

I defined 3 wolf activity centers in this area (Fig. 9). One, located in the Park Creek Drainage of Glacier National Park, is within 15 km of Highway 2. The second, located near Mt. Pablo on the Lewis and Clark National Forest, is also within 15 km of Highway 2. However, even though both are close to a busy highway, they are effectively remote. During the summer tourist season, Glacier National Park sustains heavy backpacking use; however, in the off-season (October through May) few people reach the backcountry of the Park. The Badger Creek-Two Medicine River area is much less heavily traveled by backpackers and hikers but has significant horse travel and hunting in fall. The third activity center is near the Continental Divide in the southeast portion of the area and is closer to the agricultural activity of the Great Plains.

Human population centers in this range include East Glacier (pop. 300), Essex (pop. 25), and West Glacier (pop. 350), all located on Highway 2. Heart Butte (pop. 25) is located on the Blackfeet Indian Reservation.

Highway 2 is the main road in the area. A seasonally open, gravel road connects Highway 2 and the Spotted Bear Ranger Station at the south end of Hungry Horse Reservoir. Much of the area southwest

of the Hungry Horse Reservoir has been logged and roaded. Primitive roads follow many of the major drainages on the east side of the Divide. Portions of the Middle Fork of the Flathead River have been classified as wild and scenic river and the proposed Great Bear Wilderness Area is also within this range.

Because of their remoteness (especially in winter) and the big game wintering there, the following areas may be important to wolves. Elk winter along the lower Spotted Bear River and portions of the South Fork of the Flathead River. Simmons (1974) mentioned areas near Soldier Mountain, upper Schafer Creek, Pivot Mountain, and Calbick Creek as important early summer cow-calf concentration sites. Smith (pers. comm.) mentioned Spruce Park, Larch Creek, and sites along the Middle Fork between Twenty-five Mile and Vinegar creeks as important elk wintering areas in the Middle Fork of the Flathead River. Martinka (1976b) discussed the extent of elk winter range along the southwest boundary of Glacier National Park. Using his data, the following areas hold significant numbers of wintering animals and are removed from extensive human influence: lower Park Creek, Elk Mountain, Coal Creek, Olc Creek, Bear Creek, and the Double Mountain vicinity.

The Fielding to East Glacier area includes deer, elk, and moose winter ranges. Elk and deer winter along the eastern Rocky Mountain Front in the vicinity of upper Sheep Creek, Scoffin Butte,

South Fork of Dupuyer Creek, Blackleaf Creek, Antelope Butte, and the North Fork of the Teton River from Choteau Mountain south. Moose winter near Elk Calf Mountain in the upper Little Badger Creek and upper Badger Creek drainages. All of these sites may be important to wolves.

Bob Marshall-Scapegoat area. I collected 26 wolf reports made between 1974 and early 1977 from the Bob Marshall-Scapegoat area (Table 8 and Fig. 10). Also included on Fig. 10 are locations of 2 wolves killed prior to 1974, 1 near Lincoln in 1964 and 1 southwest of Augusta in 1968. Complete details of individual reports are contained in Appendix A.

Four observations made in 1974 were reported (Nos. 1 through 4). One of these was of a wolf killed in the North Fork of the Sun River Drainage on 11 November 1974. The animal was estimated to be 5 years old (Nowak 1975). Three other 1974 reports were of single animals and do not seem interrelated.

Thirteen observations made in 1975 were reported (Nos. 5 through 17). Numbers 5, 8, and 9 were made near Cooper's Lake and were all of single animals. Numbers 6, 7, 10, and 11 were made in the upper Dry Fork and North Fork of the Blackfoot River drainages. These 2 clumps of reports are in close proximity and may be of the same animals.

Table 8. Summary of reports from the Bob Marshall-Scapegoat area, 1974 through early 1977 (including 2 earlier wolf mortalities).

Number	Observer	Date	Group size	Description
1	Carlson	11/11/74	1	Dead wolf found
2	Underwood	1/74	1	Dark-colored wolf
3	Arvidson	9/30/74	1	Heard howling
4	Peterson	Fall/74	1	Light-colored wolf
5	Trezona	3/75	1	Tracks
6	Hooker	Spring/76	1	White wolf seen
7	Hooker	Fall/75	1	Heard howling
8	Hooker	Fall/75	1	Tracks
9	(Employee of Hooker)	Fall/75	1	Gray wolf
10	Shepard	12/19/75	1	Tracks (125 mm long)
11	Shepard	12/21/75	1	Tracks (125 mm long)
12	Massee	Fall/75	1	Heard howling
13	Mercer	Winter/75	1	Silver gray wolf
14	Mercer	Winter/75	1	Silver gray wolf
15	Schallenberger	1/7/75	2	Tracks
16	Schallenberger	10/11/75	2	Tracks
17	Carlson	11/75	1	Tracks
18	McDowell	1/20/76	3	Dark gray wolves
19	Shepard	1/22/76	1	Tracks

Table 8 (continued).

Number	Observer	Date	Group size	Description
20	McDowell	6/76	1	Gray wolf
21	(Unknown)	7/9/76	1	Tracks (125 mm long)
22	Krucky	7/25/76	2	Adult and pup, both light gray
23	Mueller	7/27/76	1	Gray wolf
24	Klaver	8/13/76	1-2	Heard howling
25	Trezona	8/76	2	Tracks
26	Evans	10/13/76	1	Light gray wolf
27	Youderian	1964	1	Shot wolf, skull examined
28	Ingersoll	1968	1	Shot wolf, identified as C. l. irremotus

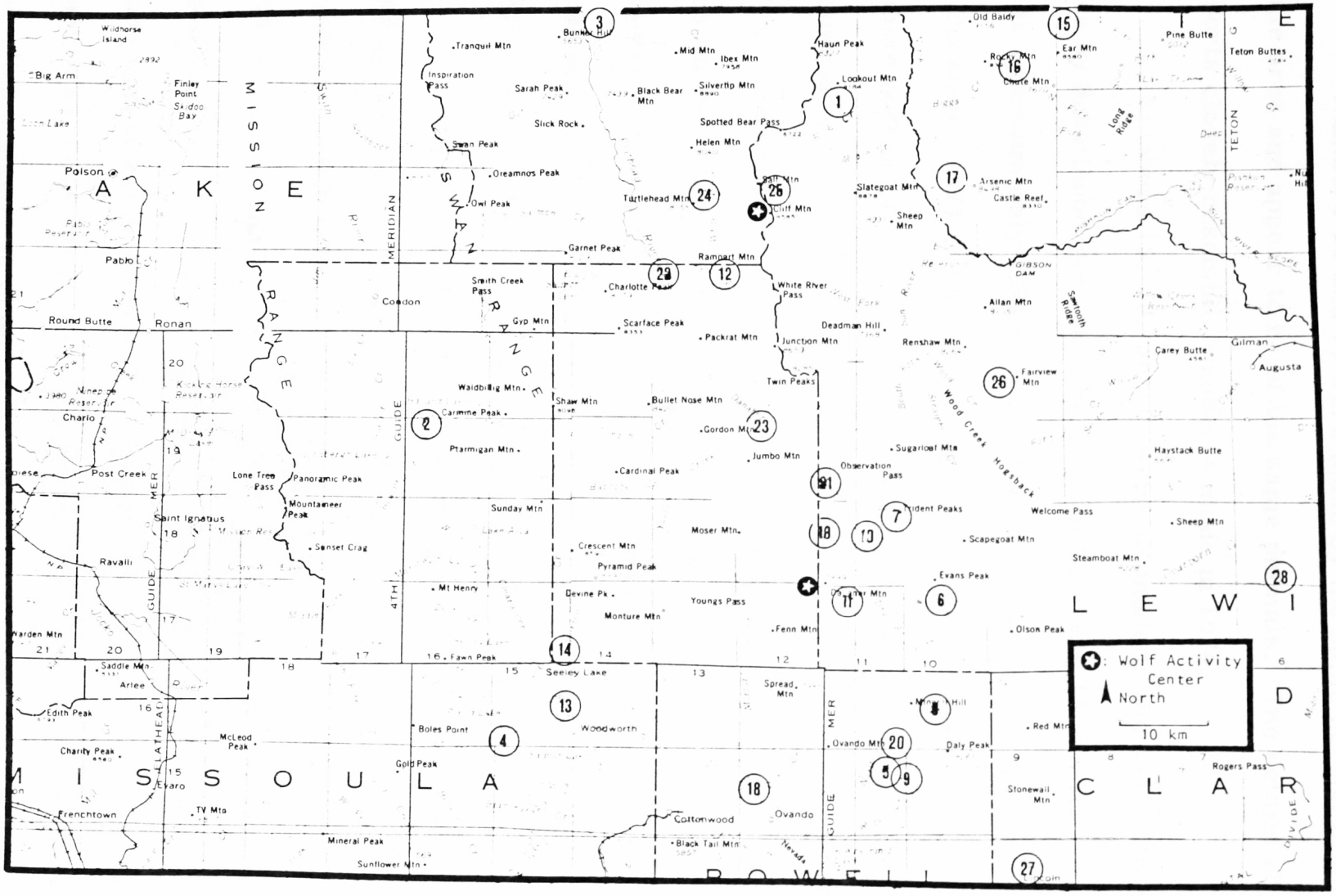

Fig. 10. The Bob Marshall-Scapegoat area boundaries and location of wolf observations from 1974 to present.

Numbers 13 and 14 were made by the same person in the same area and appear to be of the same animals. The details of these reports closely resemble Number 4 made in 1974.

Numbers 15, 16, and 17 were all made in the Teton River area by Schallenberger, the observer in Numbers 15 and 16. Number 15 is approximately 1.5 km south of an observation of 2 wolves made in December 1974 and shown in Fig. 9. Report Number 12 is from a remote portion of the Bob Marshall Wilderness and is isolated temporally.

Nine observations made in 1976 were reported (Nos. 18 through 26). An isolated report (No. 18) of 3 wolves was made by Joe McDowell, a well-qualified observer. Number 20 correlates well with those made in 1975 near Cooper's Lake. Number 19 was made by a trapper who made 2 similar reports during late 1975.

Five observations (Nos. 21 through 25) of a single gray to light gray wolf or of a gray wolf and pup were made in the Danaher Creek area north to the White River from 9 July 1976 to 13 August 1976. Tracks observed on 9 July (No. 21) were similar in size to those reported in Numbers 10, 11, and 19. Numbers 22 and 23 were of similar-colored animals and Number 22 was of an adult and pup. Number 24 was made by Robert Klaver, a very competent observer who holds a Master of Science degree in Wildlife Biology. Number 25 was made approximately 10 km east of Number 24 and was of 2

animals, possibly an adult and pup.

Number 26 was made by Roger Evans, the Lewis and Clark National Forest Staff Wildlife Biologist, and 3 other Forest Service personnel. Its isolation may indicate a lone wolf traveling through the area.

Numbers 27 and 28 were made in 1964 and 1968, respectively, and are included here because they concern verified wolf mortalities. Both involve wolves that were shot near populated areas.

Important areas within the Bob Marshall-Scapegoat area include the White River Drainage, the Danaher Basin, and upper Dry Fork. Areas from the Teton River south through the Sun River country along the east front have previously been important to wolves (Appendix A).

Because of their remoteness (especially in winter) and the proximity of wolf reports, the following areas may be important to wolves. The entire South Fork of the Flathead River bottomland provides winter range for elk. Deer also winter at various sites along the South Fork (e.g., Youngs Creek, White River, and the Big Salmon Lake area). Elk and moose winter in the upper Dry Fork Drainage. Most of the upper Swan Valley is important white-tailed deer winter range. Lower Montour Creek, the Ovando Mountain area, and areas along the Clearwater River adjacent to and south of Placid Lake provide elk and white-tailed deer winter range. The entire eastern

Rocky Mountain Front is big game wintering range. Mule deer and bighorn sheep winter from Ear Mountain south to Sun River. Elk, bighorn sheep, mule deer, and some white-tailed deer winter in the lower Sun River Drainage from Slategoat Mountain through the Sun River Game Range, south through the Fairview and Ford Creek plateaus to Rogers Pass. The Sun River Game Range may be very important to wolves in certain years. A small herd of bighorn sheep wintering at the confluence of the West and South forks of Sun River (Pretty Prairie) may be vulnerable to wolves during severe winters.

Important wolf travel routes may be the Dwight Creek Drainage and the Dry Fork-Danaher Divide, the foothill region between Lincoln and Ovando, the Fairview Mountain area, White River Pass, Observation Pass, and the region between Holland and Lindbergh lakes.

I placed wolf activity centers near Cliff Mountain in the Bob Marshall Wilderness Area and on the Danaher Divide between the Bob Marshall and Scapegoat Wilderness areas (Fig. 10). Both these centers of activities have no roads near them; however, a well-maintained system of pack trails occurs throughout each wilderness. The main highways are State Highway 200 running east and west through Lincoln (pop. 1005) and Ovando (pop. 120), and the Seeley-Swan Highway (No. 209) running north-south through Condon (pop. 30) and Seeley Lake (pop. 800). Fairly extensive logging and road building has occurred in the Swan Valley. Generally, the region east of Ear

Mountain, Sawtooth Ridge, and Steamboat Mountain is devoted to ranching with resultant roads and population centers. The nearest large population centers are Missoula, population 30,000; Great Falls, population 60,091; and Kalispell, population 10,526.

From these reports, a minimum of 2 wolves may occur in the White River-Danaher-upper Dry Fork area. One wolf may occur on the east side of the Divide near Fairview Mountain. A minimum of 1 wolf may occur in the upper Swan Valley-Seeley Lake area.

Sheep Creek area. Thirty-five observations made since 1974 were reported from the Sheep Creek area (Fig. 11 and Table 9).

Nine observations were reported in 1974 (Nos. 1 through 9). Numbers 1, 2, and 3, from the same area, involve more than 1 animal, and correlate well in details. Andy Ogden, the observer in Number 2, is an Idaho Department of Fish and Game warden. Numbers 4 through 9 are from the north end of the Tendoy Range and the upper Horse Prairie area. The animal seen in 4, 5, and 6 was described as being "light colored," "tan, light colored," and "buff gray," respectively. Numbers 7 and 8 were made within 10 km of each other and could involve the same animals.

Thirteen observations made in 1975 were reported (Nos. 10 through 22). Nine of these were made in the Little Sheep Creek area (Nos. 10 through 18). Numbers 10, 11, 13, 14, and 17 involve

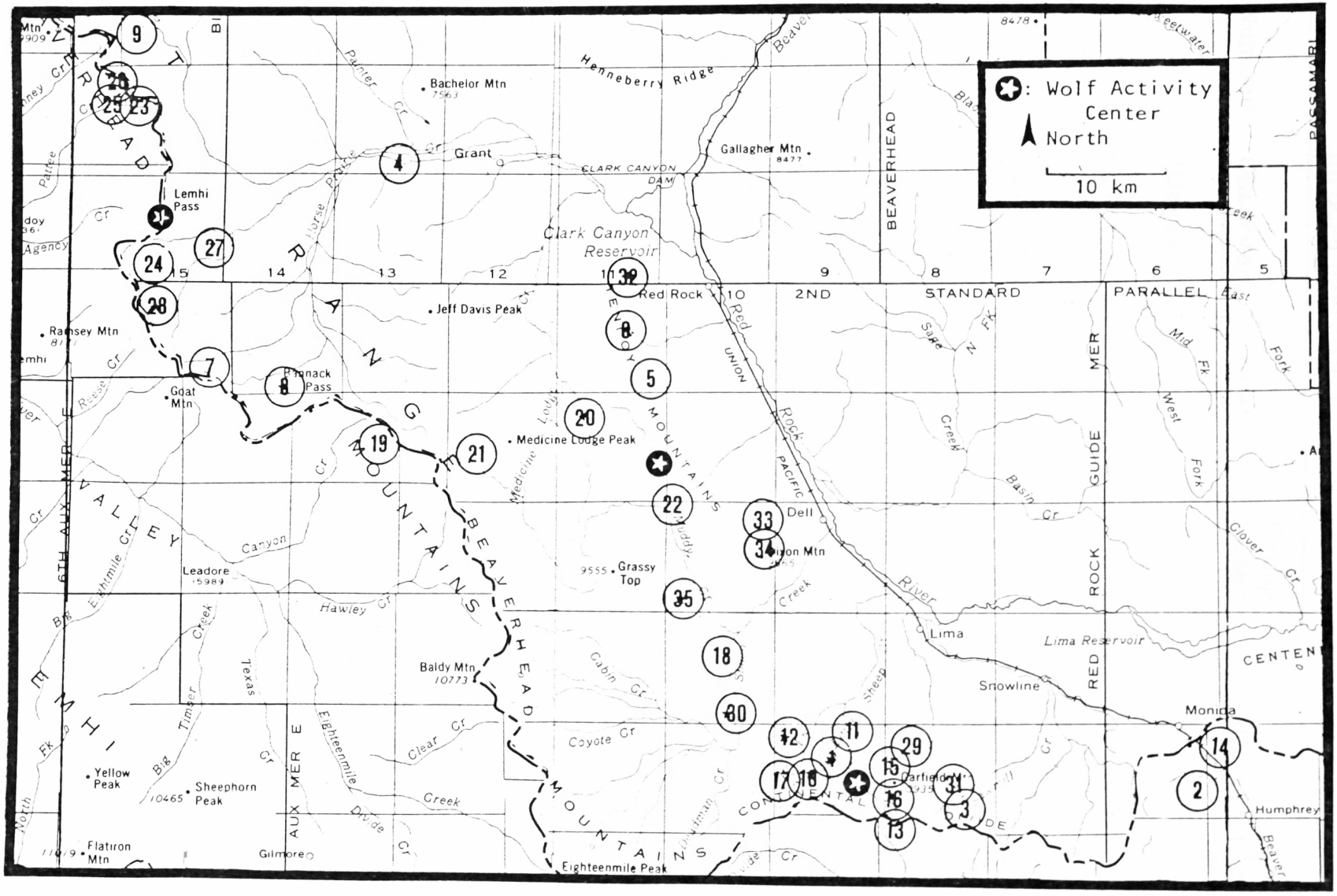

Fig. 11. The Sheep Creek area boundaries and location of wolf observations from 1974 to present.

Table 9. Summary of reports from the Sheep Creek area, 1974 through early 1977.

Number	Observer	Date	Group size	Description
1	Hildreth	1/74	6	Tracks
2	Ogden	1/20/74	2	1 charcoal gray, other lighter gray
3	Buhler	Fall/74	2	Both dark, 1 larger
4	Wellborn	6/74	1	Light-colored wolf
5	Pierce	6/74	1	Light-colored wolf
6	Jones	7/74	1	Light-colored wolf
7	James	10/74	2	Grayish brown colored
8	Jones	10/74	1	Tracks
9	Pierce	11/74	1	Gray-colored wolf
10	Jensen	9/75	6	Tracks about 125 mm long
11	Allen	10/75	6	1 gray, 1 blackish brown, 4 lighter
12	Carpenter	11/75	1	Tracks about 112 mm long
13	Detton	11/75	4	All gray colored
14	Ogden	Fall/75	3	Dark colored
15	Buhler	Fall/75	1	Gray colored
16	Miner	12/75	1	Tracks
17	Allen	12/75	4-6	Heard howling

Table 9 (continued).

Number	Observer	Date	Group size	Description
18	Peterson	12/75	1	Heard howling and found tracks
19	Guillette	7/75	1	"Dark yellow gray"
20	Jones	10/75	1	Heard howling
21	Wheekly	12/75	1	Dark gray
22	Wellborn	12/75	1	Dark
23	Fisher	6/17/76	1	"Gray-yellowish" pup
24	Basye	7/13/76	1	Heard howling
25	Day	8/11/76	1	Heard howling
26	Daneke	8/12/76	1	Heard howling
27	Turango	10/4/76	1	Reddish-brown
28	Potter	11/28/76	1	Tracks
29	Jensen	2/76	2	Dark gray
30	Peterson	2/76	2	Tracks
31	Kolar	10/25/76	1	Brown-colored wolf
32	Walker	Fall/76	1-2	Tracks
33	Hildreth	Spring/76	1-2	Howling
34	Hildreth	Fall/76	1-2	Howling
35	Daneke	1/77	4-6	Tracks

possibly 6 wolves. Three well-qualified observers are included: Norton Miner (No. 16), former USFWS, Director of Animal Damage Control for Montana and Wyoming; Dick Carpenter, Animal Damage Control Officer from Dillon; and Andy Ogden, previously mentioned. Observations of this possible pack include an account of tracks (No. 10), howling (No. 17), and direct observations (Nos. 11, 13, and 14).

Four observations made in 1975 were from the Medicine Lodge and Muddy Creek drainages (Nos. 19 through 22). All 4 were of single animals described as dark colored. Numbers 19 and 21 appear closely related as do Numbers 20 and 22. Carl Guillette, the observer in No. 19, is the Salmon National Forest District Ranger at Leadore, Idaho.

Twelve observations made in 1976 were reported (Nos. 23 through 34). Six were from the Lemhi Pass region (Nos. 23 through 28). Number 23 involved an observation of a "gray-yellowish" colored wolf pup (note similarity of color description between this observation and No. 19). At almost exactly that same location and about 2 months later, Dennis Daneke and I elicited a wolf howl (No. 25). Again at that same location and 1 day later, Daneke elicited another wolf howl (No. 26). The following description is from Daneke's field notes:

> I thought I heard an animal in the brush ahead of me and stopped to look and listen. I waited about 5 minutes and hearing and seeing nothing, I decided to try a bio-auditory howl. I howled

> 2 [times] and received a response within 30 seconds. The response came from within 50 yards . . . very close and definite. I could then hear the animal start to circle downwind. As I could not visually locate the animal, I decided to howl again . . . I received a response within 30 seconds again . . . . After howling 3 times with some barks, it began to move again . . . reached a downwind position and could be heard briefly moving directly away somewhat faster.

Numbers 24 and 27 were made by Selway Ranch personnel (located in the Lemhi Pass area) and seem to correlate well with other reports. Number 28 was made by 2 BLM employees south of Lemhi Pass.

Six 1976 observations were made in the Little Sheep Creek area (Nos. 29 through 34). The largest group size reported was 2 compared to 6 in 1975. However, 5 of the 6 reports (Nos. 29, 30, and 32 through 34) involved 2 wolves. Numbers 29, 30, and 31 were from the same area that many 1975 reports were from: upper Sawmill Creek, Garfield Mountain, and both forks of Little Sheep Creek.

One 1977 observation (No. 35) of tracks of 4 to 6 wolves in the Muddy Creek Drainage was reported.

I defined 3 wolf activity centers; the first located at Lemhi Pass and based on reports both north and south of the Pass into Idaho and Montana (Fig. 11). Only 1 maintained gravel road crosses (at Bannack Pass) the nearby Continental Divide. All other roads along and crossing the Divide are only open during summer although snowmobiles use them in winter. The upper Horse Prairie region has a number of ranches and most of the Forest Service and BLM land

around the center of activity is leased for grazing. Idaho State Highway 28 parallels the Continental Divide approximately 20 km west of the activity center. A primitive road runs from Lemhi Pass north and south along the Continental Divide. The nearest major highway in Montana is Interstate 15, approximately 50 km east of the center of activity. Grant, Montana (pop. 10) and Tendoy, Idaho (pop. 20) are the nearest human population centers.

Another wolf activity center is located near the headwaters of Muddy Creek in the Tendoy Mountains (Fig. 11). A number of primitive roads and jeep trails allow access to the Tendoy Range. None are open during late fall, winter, or early spring. Clark Canyon Reservoir, approximately 20 km north of the center of activity, attracts a large number of recreationists, mainly fishermen. The entire Tendoy Range is grazed and large ranches are located in the Big Sheep and Medicine Lodge Creek drainages and along Interstate 15. The nearest population centers are Dell (pop. 35) and Lima (pop. 351). Dillon (pop. 4548), approximately 60 km northeast, is the nearest large town.

The third wolf activity center is located near Garfield Mountain (Fig. 11). This area and adjacent areas of Idaho provide extremely remote habitat for any wolves present. One ranch family in Little Sheep Creek and 3 in the Big Sheep Creek drainages are the only residents in the area. The Continental Divide rises to elevations

approaching 3360 m. The nearest population center is Lima. Main access to the area is from a primitive road up the Little Sheep Creek Drainage.

Important wolf prey concentrations near the Lemhi Pass activity center are summarized as follows. Upper Bear, North and South Frying Pan, Trapper creeks, and Black Canyon, as well as areas along the Continental Divide, provide important elk summer and fall ranges. Elk winter in Henderson Gulch and along lower Maiden and Horse Prairie creeks. Elk calving areas near lower Teepee Creek and Cottonwood Creek may be seasonally important to wolves. Depending upon the severity of the winter, elk and deer winter on lower-elevation private lands in both Idaho and Montana.

Extensive mule deer wintering areas are located near the Muddy Creek activity center. Pileup, Patterson, and Caboose canyons, as well as the Muddy Creek Drainage, are all important mule deer winter ranges. Also, lower slopes along Limekiln, Kelmbeck, and McKnight creeks and in McKenzie, Little Water, and Dry canyons on the east side of the Tendoys contain extensive mule deer winter ranges. Elk winter in the lower Trail Hollow and Williamson Wood canyons and in the Muddy Creek Drainage.

Excellent correlations exist between seasonal wolf reports and prey use of areas near the Little Sheep Creek activity center. An elk calving area near the headwaters of Sawmill Creek may be

especially important to wolves. Areas along the Continental Divide are important elk summer range. Elk winter on the ridge between Deep Creek and Sawmill Creek.

Domestic cattle may also provide sustenance for wolves in the Sheep Creek area either as carrion or as direct prey. Ranchers, however, have not complained of extensive losses to predators.

Important areas for wolves in the Sheep Creek area may be the Continental Divide region from Goldstone Pass to Monida Pass. The Little Sheep Creek region seems especially important because of the possibility of a pack of 4 to 6 wolves occurring there. The area south of Little Sheep Creek on the Idaho side may also be important because of its remoteness and the good mule deer and pronghorn winter range. The Tendoy Mountains may be of more importance to wolves in winter since they are heavily grazed and are fairly accessible during summer.

At least 1 wolf used the Lemhi Pass area during the summer of 1976. Reports indicate that as many as 4 to 6 wolves may occur in the vicinity of Little Sheep Creek.

Big Hole-Pioneer area. Eleven observations made between 1974 and early 1977 were reported from the Big Hole-Pioneer area (Table 10 and Fig. 12). All reports except Numbers 6 and 7 involved single animals. Report Numbers 2 and 3 involved a single dark gray

wolf seen in 1975. During fall 1976, a gray wolf was reported (No. 11) in the same area. This difference in color could be explained by differences in color perception by the observers. Because the area between Wisdom and Elkhorn Springs has no developments or roads, the 2 reports from the Wisdom area (Nos. 5 and 8) could be of the same animal.

Table 10. Summary of reports from the Big Hole-Pioneer area, 1974 through early 1977.

Number	Observer	Date	Group size	Description
1	Burwell	Winter/74	1	Tracks
2	Parsell	Summer/75	1	Dark gray
3	Parsell	Summer/75	1	Dark gray
4	Walker	10/75	1	Tracks
5	Lawson	10/75	1	Howling
6	Lawson	1/76	2	Gray
7	Rouse Ranch employee	12/75-6/76	2	Gray
8	Daneke	6/7/76	1	130-mm long tracks
9	McIntosh	7/17/76	1	Howling
10	Daneke	8/9/76	1	Howling
11	Stricklen	10/25/76	1	Gray

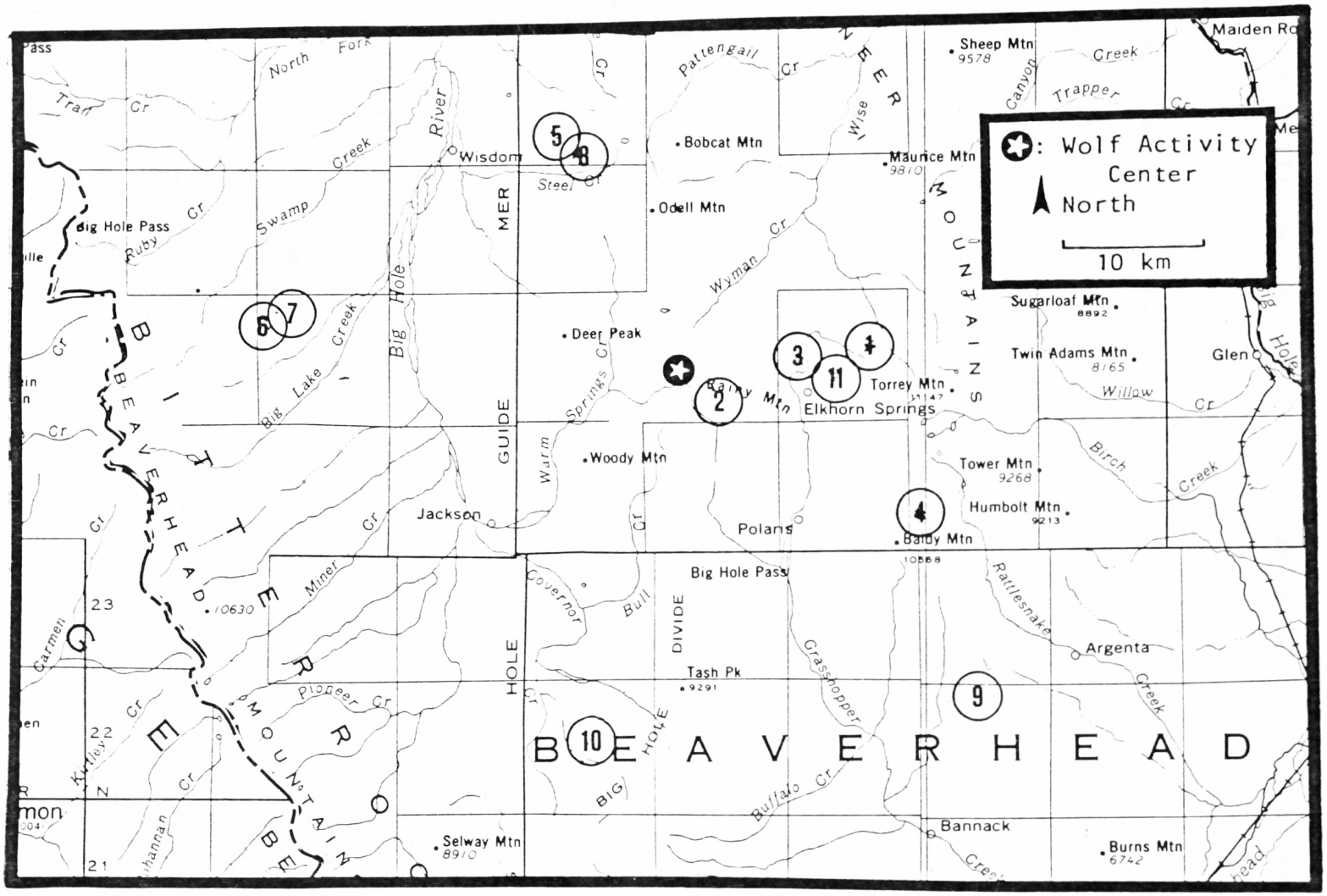

Fig. 12. The Big Hole-Pioneer area boundaries and location of wolf observations from 1974 to present.

Number 10 seems more closely associated with reports made during the same time period in the Lemhi Pass region (Sheep Creek area, Fig. 11). Numbers 6 and 7 involve a pair of gray wolves seen a number of times by at least 3 different observers. The observers believed the animals were a mated pair and produced pups, however, no pups were seen. Because no maintained roads cross the Idaho-Montana Border (Continental Divide) between Numbers 6 and 7 and the Lemhi Pass area, Numbers 6 and 7 may involve animals that were reported later in the summer of 1975 north of Lemhi Pass.

I placed the wolf activity center near Rainy Mountain (Fig. 12). Reports from this area are not as numerous as from other areas and, therefore, information on possible wolf use of the area is less accurate.

State Highway 43 connects State Highway 93 and Interstate 15. County Road 278 connects Wisdom with Jackson and on to Interstate 15. Population centers in the area include Wisdom (pop. 154), Jackson (pop. 82), Polaris (pop. 20), Bannack (pop. 15), and Elkhorn Springs (pop. 20). A north-south county road running from Bannack through Polaris and Elkhorn Springs to Wise River where it connects with State Highway 43 provides fairly good access to the area. The entire Big Hole Drainage has numerous ranches. The nearest large population centers are Butte (pop. 23,368) about 85 km northeast, Dillon (pop. 4548) about 50 km southeast, and Salmon, Idaho (pop. 3500)

about 80 km southwest.

A number of prey concentration areas may be important to wolves. Elk winter along the foothills on the west side of the Pioneer Range, in the Devil's Hole area, upper Cattle Gulch, and Trusty Gulch. Elk calving areas include the Woody Mountain and Jerked Prairie areas. Important elk summer ranges include upper Alder Creek, Alder Mountain, and various other high elevation areas. Approximately 500 to 600 mule deer and a similar number of elk usually winter along the east side of the Big Hole Valley. Much of this winter range is on private lands. Moose winter throughout the willow bottoms of the Big Hole and Wise rivers. Specific important areas include those at the confluence of Skull and Pattengail creeks with the Wise River, the Wise River near the Flying Cloud Ranch, Gold Creek, and lower Trapper Creek.

Gravelly Range area. I collected 11 reports of wolf observations made since 1974 from the Gravelly Range area (Table 11 and Fig. 13). I did not spend a great deal of time attempting to collect reports from this area in 1976 or 1977. Details of all reports collected are contained in Appendix A.

Evidence seems very good that a pair of wolves use portions of this area, and that pups have been produced. Baker's observation (No. 1) of a wolf den and pups seems good in all respects. I visited the

Table 11. Summary of reports from the Gravelly Range area, 1974 through early 1977.

Number	Observer	Date	Group size	Description
1	Baker	5/26/74-7/1/74	5	2 adults, 3 pups (1 adult dark, 1 pup dark)
2	Neal	10/14/74	5-6	Tracks seen
3	Carpenter	12/74	2	Tracks
4	McKenna	4/75	1	Tracks
5	Neal	6/20/75	2	Pair of wolves (1 dark) and tracks
6	Cartee	7/16/75	2	1 wolf answered another
7	Cartee	8/75	1	Howling
8	Baker	Summer/75	1	Gray
9	Baker	Summer/75	1	"Blueish"
10	Carpenter	10/75	1	100 mm tracks
11	Sagota	8/76	1	Gray

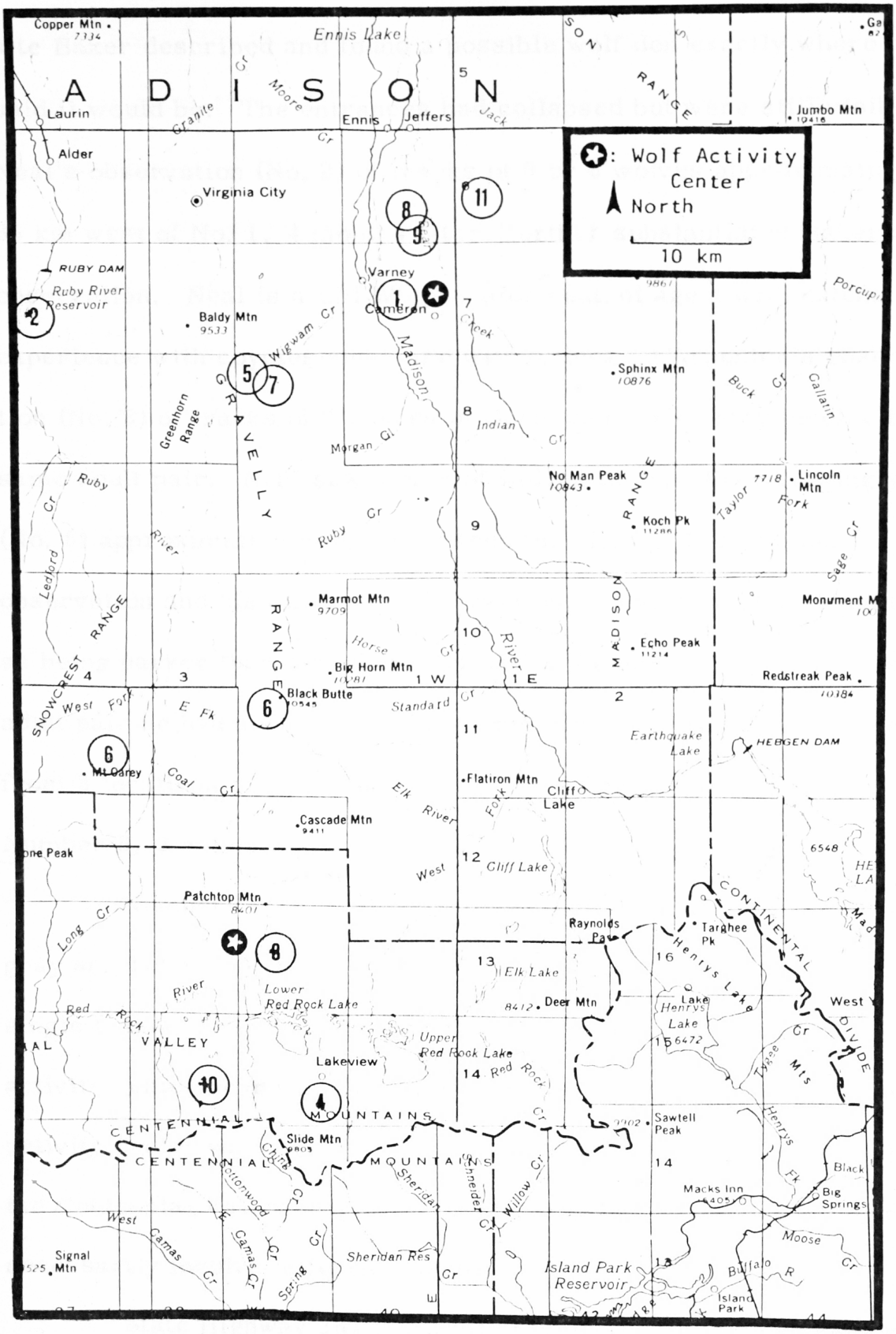

Fig. 13. The Gravelly Range area boundaries and location of wolf observations from 1974 to present.

site Baker described and found a possible wolf den exactly where he said it would be. The entrances had collapsed but were still visible. Neal's observation (No. 2) of tracks of 5 or 6 wolves approximately 35 km west of No. 1, 4 months later, further substantiates Baker's observation. Neal is a USFWS predator control agent with extensive experience with coyotes and some with wolves. Carpenter's observation (No. 3) of tracks of 2 wolves in December 1974, may involve the same adult pair. Neal saw a pair of wolves in June the following year (No. 5) approximately midway between the sites of Baker's den observation and his own track observation. Neal described 1 animal as being darker than the other, exactly as Baker had described the adult pair he had seen near the possible den. Howling was reported from 3 locations in the Gravellies by Mike Cartee (Nos. 6 and 7). In Number 6, 2 animals were involved.

Numbers 8, 9, and 11 involve single animals, 2 described as gray and 1 darker ("blueish"). Numbers 4 and 10 involve tracks of a single animal observed by well-qualified persons. I placed a wolf activity center near Cameron in the Madison River Valley. Another activity center was located at the south end of the Gravelly Range near the Centennial Valley (Fig. 13). I do not believe these activity centers necessarily involve different wolves.

State Highway 287 is a well-traveled route to West Yellowstone and Idaho. The entire Madison River Valley is heavily ranched and a

large portion of the Gravelly Range is grazed in summer by sheep and cattle. A seasonally open gravel road runs the full length of the Gravelly Range. Ennis (pop. 501) and Virginia City (pop. 149) are the main population centers in the area. Butte (pop. 23,368) is located approximately 90 km northwest of the Cameron activity center and 150 km northwest of the Centennial activity center. Bozeman (pop. 18,670) is located approximately 65 km and 110 km northeast of the Cameron and Centennial activity centers. Dillon (pop. 4548) is located approximately 75 km west and 85 km northwest of the Cameron and Centennial activity centers.

A number of prey concentration areas may be important to wolves in the Gravelly Range. At the northwest end, Schoolmarm and Golden Sucker gulches and the Davis Creek Drainage are heavily used mule deer wintering areas. In the Snowcrest Range, the Lone Rock and Rock Creek drainages, Dark Hollow, and the Yellow Bear Lake vicinity may provide elk winter range important to any wolves present. Elk and mule deer winter extensively on the Wall Creek Game Range located at the southeast end of the Gravellies. Mule deer winter along the Madison River from Ennis to the Game Range. Important elk calving areas are located in Coal, Corral, and Shovel creeks in the central part of the Gravelly Range. Moose are also found in many drainages of the Gravelly Range and the Centennial Valley.

Fewer wolf reports were collected from the Madison Range

(east of the Madison River); however, no real barriers separate these mountains from the Gravellies. Possibly important prey concentration areas include elk winter range along the lower slopes of Mill Creek south of the Middle Fork of Bear Creek and the Bear Creek Game Range. Moose winter in the main Indian Creek Drainage and around Hebgen Lake.

The Centennial Valley and the Gravelly Range appear to be the most critical areas to any wolves present in this area. Portions of the Gravelly Range may be important for denning. Extensive aerial and ground surveys should be carefully conducted in the Baldy Mountain, upper Wigwam Creek, upper Morgan Gulch, upper Ruby Creek, and Greenhorn Range area during denning season.

Other areas. Because of the long distances and high costs involved in traveling through the study area, I was not able to visit all areas where wolves may occur. Certain regions in Idaho seem to be potentially important to wolves.

The Clearwater-Lochsa drainages of the Clearwater National Forest with large numbers of wintering ungulates is one of these areas. Also the panhandle region of northern Idaho adjacent to British Columbia may be potential wolf range.

Field efforts directed at documenting wolf occurrence should be carried out in these and other wild areas of Idaho, Montana,

Wyoming, southern Alberta, and southeastern British Columbia.

Estimate of Wolf Numbers

Since 1965, estimates of wolf numbers have been made by personnel of various national forests in Region 1. Bumstead (pers. comm.) stated, however, that Forest Service estimates are basically rough guesses based on a few wolf reports. A summary of the estimates are given in Table 12.

My estimates of minimum wolf numbers that may have occurred on the study area from 1974 through early 1977 are generally lower than those by Forest Service personnel. Based on an analysis of wolf observation reports, a minimum of 17 to 23 wolves may have occurred in the 9 areas I have identified during the study period. A minimum of 1 or 2 wolves apparently roamed in the northeast Glacier area, 1 in the northwest Glacier area, 1 or 2 in the Kootenai area, 1 in the Thompson River area, 3 or 4 in the Highway 2-Badger Creek area, 4 or 5 in the Bob Marshall-Scapegoat area, 1 in the Big Hole-Pioneer area, 4 or 5 in the Sheep Creek area, and 2 in the Gravelly area.

Because I spent more time in some areas than in others, some of these estimates are more accurate than others. Compared to estimates by Singer (1975a) and Martinka (1976a), my estimates of wolf numbers in Glacier National Park are low. Also, my estimates

Table 12. Estimates of wolf numbers in the National Forests of Region 1 (from Forest Service Annual Wildlife Reports).

Year	Beaverhead	Clearwater	Flathead	Gallatin	Helena	Kootenai	Lewis & Clark	Lolo	Totals
1976	10	7	6	0	5	6	10	5	49
1975	4	7	6	0	5	12	10	5	49
1974	2	6	5	20	5	5	10	5	58
1973	0	0	0	0	10	10	10	10	40
1972	0	0	15	0	5	3	0	2	20
1971	0	0	15	0	5	3	0	0	23
1970	0	0	15	5	5	5	0	0	30
1969	0	0	22	0	5	5	0	0	32
1968	0	0	22	0	5	5	0	0	32
1967	0	0	22	0	5	2	0	0	29
1966	0	0	10	0	5	0	0	0	15
1965	0	0	22	0	5	0	0	0	27

may be low for the Kootenai area. I did not spend any time (except through telephone calls) in the Clearwater or Panhandle National Forests.

Ecology

Pack size. Almost three-fourths (71%) of the observation reports involved single animals. Of 431 possible wolves involved in 279 observation reports, 45.9% were single animals. Groups of 2 were next common, followed by groups of 3, 4, etc. (Table 13). The largest group reported was 11 animals. Only 2 reports involved more than 6 animals.

Table 13. Group size as reported on wolf observation reports organized by township clumpings.

	Group size						
Area	One	Two	Three	Four	Five	Six	Seven+
T33N - T37N	44	5	2	0	1	0	0
T28N - T32N	44	9	4	2	0	0	0
T23N - T27N	24	11	2	2	0	1	0
T18N - T22N	17	4	0	0	0	0	0
T13N - T17N	12	1	2	0	0	0	0
T8N - T12N	2	0	0	0	0	0	0
T3N - T7N	0	0	0	0	0	0	0
T3S - T2N	2	0	0	0	0	0	0
T8S - T4S	19	5	0	0	2	0	0
T13S - T9S	25	9	0	0	0	3	2
T18S - T14S	9	6	1	3	0	4	0
Totals	198	50	11	7	3	8	2

The percentage of lone wolves varied considerably in township clumpings (Fig. 14). Ranges were from 39.1 to 100% (n = 23 to n = 2). Reports from southern Montana and Idaho (T18S to T2N) included relatively fewer single wolves than reports from northern Montana and northern Idaho (T8N to T37N). The northern townships contained 67.7% of the total number of reports collected but included only 59% of all wolves observed (Table 13).

Rausch (1967) stated that pack size in wolves is a measure of abundance--the larger the observed pack size the more abundant wolves are. Stenlund (1955) found that 42% of all observations in northeastern Minnesota were of lone wolves. In eastern Finland, 60% of all observations were of lone wolves (Pulliainen 1965). Carbyn et al. (1975), working in Prince Albert National Park, found that lone wolves made up 80.4% of all summer observations. Singer (1975a) found that 63% of all observations of wolves in northern Glacier National Park were of lone wolves.

Hendricksen et al. (1975), in discussing population status of wolves in Upper Michigan, found that lone wolves were involved in 90% of the reports (n = 68). They concluded that the reason lone wolves make up such a high percentage of those observed in that area was because reproduction seldom takes place. When reproduction does occur, human activities such as hunting and trapping probably disrupt packs before winter.

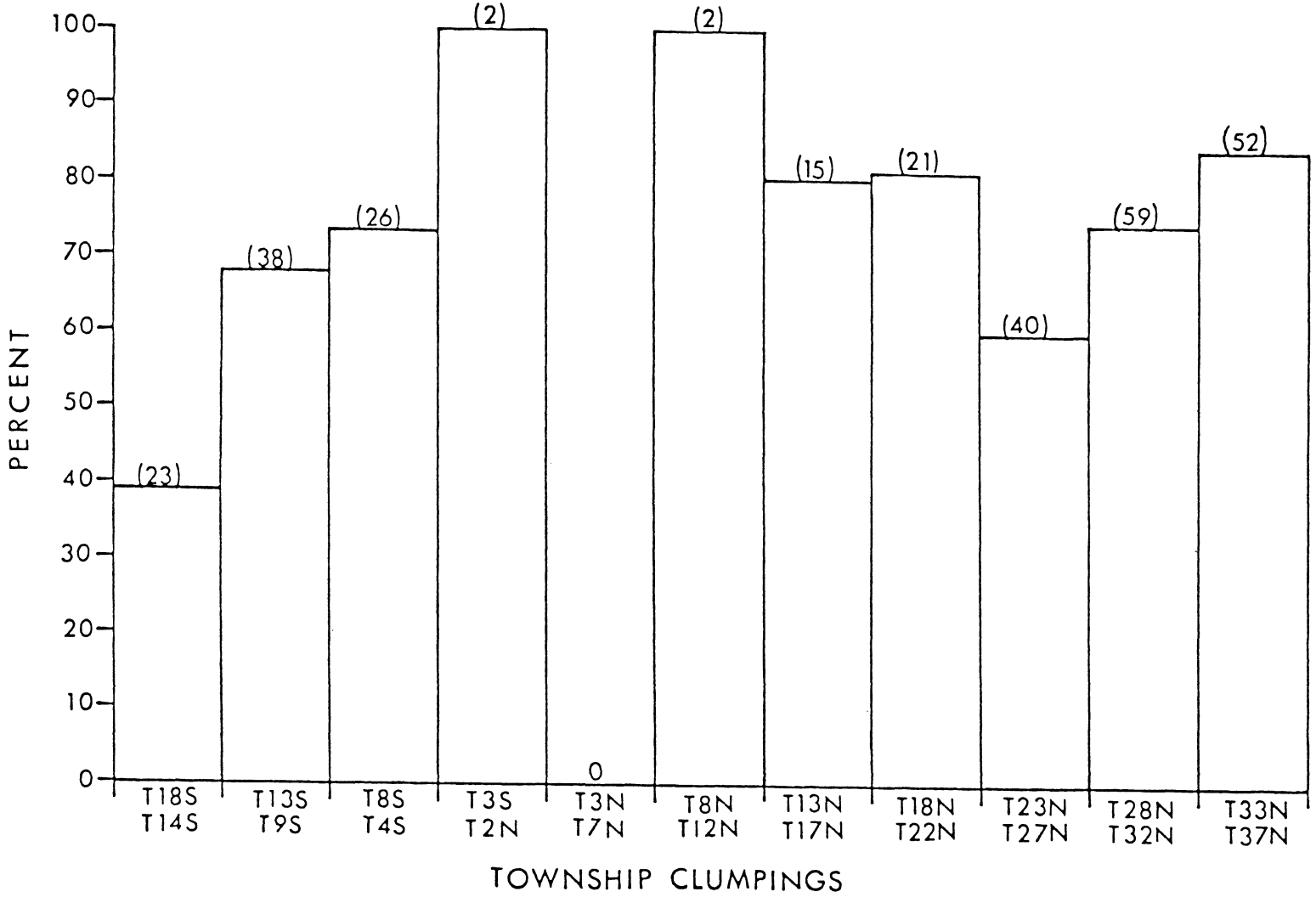

Fig. 14. Percentage of observations that involved single animals arranged by north-south distribution. (n)=total number of wolf reports.

The high percentage of lone wolves involved in the observation reports I collected indicate a low population. However, differences in percentages of lone wolves between north and south township clumpings probably is not an indication of a greater density of wolves in the southern clumping. It most likely indicates that reproduction was occurring in the southern population, but many factors may be involved such as relative reliability of observers, number of total observations in each clumping, differences in security offered by the quality of the range (i.e., wolves on the southern range may be disturbed less), and difference in relative abundance of prey species.

Reproduction. Wolf pups and possible dens were reported in the southern area from 1971 through 1976. In the Gravelly Mountains during early July 1971, Bob Neal, a USFWS employee, observed tracks of 2 wolves repeatedly in one area. Neal has had experience with wolves and believes there may have been a den nearby. During May and June 1974, Bill Baker and Bob Story of Ennis, Montana, reported 3 wolf pups at a den south of Ennis. On 20 June 1975, while conducting a helicopter survey in the Gravelly Mountains, Bob Neal and Murray Duffy saw a large number of large canid tracks. Shortly thereafter, they saw 2 adult wolves, landed, and checked the tracks which they agreed were made by wolves. Neal believes there may have been a den in the immediate vicinity. In September 1973, Don Detton, a

rancher near Lima, Montana, reportedly saw a single, light-colored adult wolf and a chocolate brown pup in the Little Sheep Creek area. During October 1975, Harry Allen of Lima, Montana, reportedly saw 2 adult wolves, 1 blackish brown and 1 gray, and 4 lighter colored pups in the Little Sheep Creek area. On 17 June 1976, Larry Fisher, a USFS employee from Salmon, Idaho, reportedly saw a single yellowish-gray colored wolf pup about 13 km northeast of Tendoy, Idaho, near the Continental Divide (I heard a single wolf howl at this location about 2 months later).

Wolf pups and possible dens were reported in the northern area during 1961, 1967, 1972, 1974, 1975, and 1976. In November 1961, Ray Mills, a USFS employee in Choteau, Montana, reportedly saw a light gray adult wolf with 2 smaller wolves, possibly pups, near the North Fork of the Sun River. One pup was light gray, the other dark gray. In May 1967, Tom Greenwood, a Montana Fish and Game Department employee, and Rice Crawford, a Blackfeet Indian, reportedly found a wolf den containing 4 pups north of Swift Dam Reservoir on the Blackfeet Indian Reservation. Burt Goodman, manager of the Sun River Game Range west of Augusta, Montana, found a freshly dug possible wolf den on the Game Range during spring 1972. Apparently, the den was never finished or used. In September 1972, Jazz Orr, a resident of the Blackfeet Indian Reservation near Heart Butte, Montana, saw 1 adult wolf with 3 pups. During summer

1974, Bill Rappold, a rancher from Dupuyer, Montana, saw an adult wolf and 3 pups a number of times in the foothills adjacent to the Lewis and Clark National Forest between Dupuyer and Sheep creeks. In the same area as Rappold's observation, Allen Mathews, a Montana Fish and Game Department warden, reportedly saw a fairly dark, adult wolf with a lighter colored pup during January 1975. On the west side of the Continental Divide, in the White River Drainage of the Bob Marshall Wilderness Area, Anton Krucky and 4 others reportedly saw a light gray adult wolf and a pup of similar color on 25 July 1976.

Breeding dates of wolves vary with latitude. Observation reports ranged from the 44th to 49th latitude. Mech (1970) discussed breeding seasons of wolves by summarizing other studies at various latitudes. According to that summary, wolves at the 44th latitude should breed in mid-February. Wolves at the Canadian Border (49th latitude) should breed in late February.

Assuming a 63-day gestation period (Woolpy 1968), pups should be born in mid-April. The earliest date pups were reported was in May by Bill Baker and Bob Story near Cameron, Montana, and by Tom Greenwood and Rice Crawford near Swift Dam Reservoir in northern Montana.

Singer (1975a) believed wolves were reproducing in the North Fork of the Flathead River and mentioned breeding and some digging by a pair during February and March 1975.

Mortality factors. Compound 1080 poison stations were used along eastern and western boundaries of Glacier National Park as recently as the winter of 1952 (Singer 1975a). Local residents often carry rifles during all seasons of the year, mainly for use in coyote control. A policy of shooting wild canids has been the practice in Montana and Idaho since early ranching days.

Of 5 wolves reportedly killed since 1964, 3 were shot and 2 trapped. A number of observation reports mention shooting at the animal. I have heard rumors of at least 2 wolves shot in the Big Hole Valley of southwest Montana but have no way of determining their validity. A number of ranchers have indicated during interviews that if they did see a wolf they would try to kill it. Singer (1975a) presented evidence of 14 wolves shot and 15 trapped in northern Glacier National Park between 1910 and 1974.

I also heard rumors of illegal poisoning, using compound 1080 and strychnine, being carried out on the north and east side of Yellowstone National Park and on the Blackfeet Indian Reservation adjacent to Glacier National Park. A compound 1080 poison station was in use throughout the study period about 5 km north of Waterton Lakes National Park in Alberta. This station was run by the Municipality of Cardston, Alberta, for control of coyotes (Winkler pers. comm.).

Other possible mortality factors include disease, malnutrition,

accidental death, and predation.

Food habits. Only limited information can be obtained from the wolf observation reports on the food habits of wolves in the northern Rockies. Eight reports mentioned wolves having killed or fed on large mammals. Nine deer, 1 elk, 3 domestic sheep (Ovis aries), and 1 young horse (Equus cabalus) were reportedly killed and fed on by wolves. Singer (1975a), in analyzing the wolf reports he collected in northern Glacier National Park, found that wolves killed 8 white-tailed deer, 3 moose, 1 elk, 1 beaver, and several snowshoe hares (Lepus americanus).

Carbyn (1974) studied wolves in Jasper National Park, Alberta, a mountainous area with a variety of prey species similar to western Montana. He found that mule deer were the "preferred prey," being taken with greater frequency than their relative abundance would indicate. Mule deer made up 43% of the annual diet of the wolf pack. However, they accounted for 50% of the winter diet. Elk provided 46% of the total diet during early and midsummer (when elk calves were available) but only 25% of the total winter diet. Elk made up 30% of the wolf pack's annual diet. Moose (8%), bighorn sheep (Ovis canadensis) (3%), small mammals (3%), and caribou (Rangifer tarandus) (less than 1%) made up the remainder of the annual diet (Carbyn 1974).

In Minnesota and eastern Canada, white-tailed deer are the

primary prey of wolves with beaver and moose important locally (Thompson 1952, Stenlund 1955, Rausch 1967, Pimlott et al. 1969, Mech 1970 and 1973, Van Ballenberghe et al. 1975). Wolves switch to different prey species or age classes within a species as prey availability and susceptibility change. Cowan (1947) and Carbyn (1974) noted an abrupt switch from mule deer to elk calves during summer months. Thompson (1952) described heavy use of white-tailed deer fawns when they became available in May and June. On Isle Royale, Mech (1966) found that wolves killed primarily old moose and young of the previous year during February and March, but in late May when moose calves were born, predation pressure shifted to the newborn segment of the population.

Because the Montana Rockies are similar topographically and biologically to the Canadian Rockies of Jasper National Park, I would expect mule deer, white-tailed deer, and elk to be the primary prey species of wolves. Local conditions would dictate optimal prey species.

Taxonomic Status

Few recent data are available on the taxonomic status of wolves in the northern Rocky Mountains. Of 3 verified wolves killed since 1964, only 1 was classified to subspecies. That wolf was shot in 1968 southwest of Augusta, Montana. Nowak (pers. comm.), after

analyzing the cleaned skull, stated that it exhibited characteristics most similar to NRMW. The wolf weighed 43.1 kg 3 days after it was killed and was gray to dark gray in color.

In 1974, a wolf was found dead in the North Fork of the Sun River Drainage by elk hunters. The carcass was deteriorated but the hide and head were salvaged. From the skull, Nowak (pers. comm.) described the animal as a wolf about 5 years old with skull characteristics within the range of variation of NRMW. Some dental abnormalities were found, indicating possible captivity. Sex and weight of this gray-colored wolf are not known.

One hundred and fifty-four reports included a description of the color of 217 possible wolves. Colors ranged from black to white, with gray being most common (40.5%) (Table 14).

An obvious difference exists between the north and south township clumpings. When only dark colors (black and dark gray), gray, and light colors (light gray and white) are included, the northern township clumping shows a higher occurrence of dark-colored wolves (Table 15).

Young and Goldman (1944) described NRMW as a light-colored subspecies with individuals of the black phase uncommon. However, the subspecies north of NRMW, C. l. occidentalis and C. l. columbianus have more dark-colored individuals. The range of C. l. occidentalis and C. l. columbianus is nearer the northern

Table 14. Summary of data on color of wolves seen.

	Black	Dark gray	Gray	Light gray	White	Brown
North township clumping T8N - T37N	12 (9.3%)	39 (30.2%)	38 (29.5%)	32 (24.8%)	3 (2.3%)	5 (3.9%)
South township clumping T18S - T2N	0 (0.0%)	24 (27.3%)	45 (51.1%)	12 (13.6%)	0 (0.0%)	7 (8.0%)
Total	12 (5.5%)	63 (29.0%)	83 (38.2%)	44 (20.3%)	3 (1.4%)	12 (5.5%)

Table 15. Number of dark wolves reported compared to light wolves between the north and south township clumpings.

	Dark	Gray	Light
North township clumping T8N - T37N	51 (41.1%)	38 (30.6%)	35 (28.2%)
South township clumping T18S - T2N	24 (29.6%)	45 (55.6%)	12 (14.8%)
Total	75 (36.6%)	83 (40.5%)	47 (22.9%)

township clumping than the southern. One explanation for the increased percentage of dark wolves seen in the north is a normal intergradation of characteristics with adjacent subspecies.

Another possible explanation for the differences in color between the township clumpings is, as Singer (1975a) pointed out, that observers may be more likely to report seeing a black or dark-colored wolf. Light-colored animals may be dismissed as coyotes whereas dark animals make more of an impression on the observer. However, this would seem to be an equal bias for the 2 areas. Further, black wolves may be more visible. A single black wolf may be responsible for a number of dark-colored wolf reports included in the north township clumping.

Two possible wild mountain corridors of habitat may connect the Canadian range to southern Montana, Idaho, and Wyoming. One is the Idaho-Montana border where only 5 major highways cross the mountains between the Canadian border and Yellowstone National Park, a distance of approximately 940 km. Another possible corridor is the almost continuous stretch of designated and defacto wilderness along the Continental Divide from Waterton Lakes and Glacier National parks, through the Great Bear, Bob Marshall and Scapegoat Wilderness areas, along the east side of the Continental Divide east of Butte, into the Tobacco Root Mountains and finally into the Beaverhead area near Ennis and Virginia City. However, as indicated earlier, intervals in

both of these possible corridors are without wolf reports. Further research is needed to determine if there are wolf reports in the areas separating the 2 groups of observations and possible wolf movements between the groups.

A persistent rumor that is often stated as fact by various residents of southwestern Montana confuses matters further. These people firmly believe that approximately 6 wolves were live-trapped in Canada and released in Yellowstone National Park about 1968. The wolves supposedly traveled north and west from Yellowstone into the Beaverhead area. I could find no real evidence supporting this rumor except that it coincides with an increase in the number of wolf observations reported from Yellowstone National Park (Weaver pers. comm.). Park officials flatly deny the occurrence of a transplant (Cole pers. comm.), but private persons may have transported the animals.

The final possibility is that wolves have occurred in the Beaverhead area and southeastern Idaho since early settlement, but were localized and in very small numbers. A recent case of a small population of brown bears (Ursus arctos) going unnoticed in Norway for about 100 years illustrates how easily a remnant population of elusive animals in rugged country can be overlooked (Jonkel pers. comm.). Longtime residents of the Beaverhead area report that wolves have been present since early days but were greatly reduced from 1910 to 1960. Since the ban on poisoning, local residents believe wolf numbers

are increasing.

In northern Montana, wolves also apparently survived in very low numbers since the early 1900's. Singer (1975a) collected observation reports made from 1910 to 1975 in northern Glacier National Park. Reports I collected ranged from 1930 to the present. A number of "old timers" mention wolves being present since the original settlers arrived.

Reports indicate that wolves travel regularly back and forth across the U.S.-Canadian border in the Glacier National Park and Kootenai areas. However, Demarchi (pers. comm.), regional wildlife biologist from Cranbrook, B.C., reports a gap of approximately 165 km between the Montana wolf populations reported by Singer (1975a) and the closest wolves to the north in British Columbia. Demarchi further states that wolves in extreme southeastern British Columbia occur only as a transient population from Montana. Woods (pers. comm.), an employee of British Columbia's Fish and Wildlife Branch in the Trail, British Columbia area, stated that "positively" no wolves occur in the Pend d'Oreille Valley of Canada. To the best of his knowledge, no wolves have been seen in the Columbia and Kootenai drainages during the last 15 years.

Gunson (pers. comm.) and Barrett (pers. comm.) state that wolf sightings were rare in the foothills area of southwestern Alberta approximately 95 to 145 km north of the U.S.-Canadian border in the

early 1970's. However, in the last 2 to 3 years the number and distribution of wolf sightings have definitely increased. Gunson (pers. comm.) stated that there are now 2 groups of wolves west of Pincher Creek, approximately 75 km north of the U.S.-Canadian border. Winkler (pers. comm.), Chief Warden of Waterton Lakes National Park, believes wolf numbers have increased in the Park during the late 1970's.

Because wolves seem to be extending their range southward in Alberta but not in British Columbia, the genetic influence we may see in the Montana wolves could be from C. l. occidentalis, the Mackenzie Valley wolf, rather than C. l. columbianus, the British Columbia wolf, as Singer (1975a) hypothesized.

Fuller and Novakowski (1955) described specimens of the Mackenzie Valley wolf. Color ranged from black to nearly white. Out of 59 specimens, 34 were classed as gray, 2 cream-colored, 2 light brown or buff-colored, and 21 black. Gunson et al. (1976) classified 73.1% of 104 pelts taken in the range of this subspecies as gray and 25% black. This subspecies represents some of the largest North American wolves (Goldman 1944). Gunson et al. (1976) found that whole weights of adult males ranged between 40.8 kg and 70 kg and averaged 49 kg. Adult female whole weights ranged between 30.8 kg and 99.9 kg and averaged 40.9 kg.

The possible wolf trapped on 22 January 1977 near the

northeast corner of Glacier National Park was a female and weighed approximately 45 kg. In color and size, this animal more closely resembled C. l. occidentalis than NRMW.

CHAPTER V

HABITAT REQUIREMENTS

Space

Densities of wolves range from 1 per 26 km^2 to 520 km^2 according to Mech (1970) for packs in established ranges. Carbyn (1974) reported a wolf density of 1 per 225 km^2 in Jasper National Park. The territory of the pack in his study area did not compress in winter when deer and elk concentrated on wintering areas. Cowan (1947) worked in the same area as Carbyn (1974) and reported that wolf territories did compress in winter and the corresponding densities went from 1 wolf per 225 km^2 to 290 km^2 to 1 per 26 km^2 in winter.

Kuyt (1972) documented situations in northern Canada where winter wolf densities increased to 1 wolf per 17.3 km^2. He concluded that this high observed density could only occur at times of maximum winter compression of the prey population.

Parker (1973) found that as caribou concentrated on smaller wintering areas, wolf densities did not increase past 1 wolf per 19.5 km^2.

Carbyn (1974) presented an hypothesis to explain the relatively

low density of wolves in an area of diverse prey. He stated that: 1) low densities of the optimum prey species (mule deer); 2) the nature of the clumped distribution of the second most preferred species (elk); and 3) population regulating mechanisms, such as reduced fecundity and higher mortality rates that would act to reduce wolf densities if densities increased to a level where interpack competition forced packs to utilize less desirable prey species, all act to maintain low wolf densities in Jasper National Park. In parts of Montana such as the Kootenai and Sheep Creek areas, where mule deer and white-tailed deer densities are greater than in Carbyn's (1974) study area, wolf densities have the potential of exceeding 1 per 225 km^2 and approaching the maximum density found in Ontario (Pimlott 1967), Minnesota, and Isle Royale (Mech 1966, 1970, 1973) of 1 wolf per 26 km^2.

Lone wolves may cover thousands of square kilometers, and in areas of a remnant wolf population, such as Montana, the density of wolves may be as low as 1 wolf pack per 2500 km^2 or 3000 km^2 (Mech 1975).

Wolf packs had home ranges of 94 km^2 for a pack of 2 wolves in Minnesota (Stenlund 1955) and 13,000 km^2 for a pack of 10 wolves in Alaska (Burkholder 1959). Rowan (1950) and Cowan (1947), in western Alberta, determined the home ranges of packs of 8 and 4 or 5 wolves to be approximately 1830 and 155 km^2, respectively. Carbyn

(1974) estimated the home range of a pack of 10 to 14 (average 11.5) wolves at 1536 km^2.

Nutritional Requirements

Pimlott (1967) found that a deer density of 10 per 2.6 km^2 with an annual productivity of 37% would be needed to support a wolf population of 1 per 26 km^2. Mech (1970), using that equation and assuming that an average adult deer weighed 68 kg, estimated that 6800 kg to 10,200 kg of deer per wolf would be necessary to support a wolf density of 1 wolf per 26 km^2. He concluded that wolves definitely control prey populations if there is less than 11,340 kg of prey per wolf.

Carbyn (1974) found a minimum of 53 ungulates (20 elk, 20 bighorn sheep, 4 mountain goats, 4 mule deer, 3 moose, and 2 caribou) for every wolf in his study area. However, he believed that the wolf pack used a larger area, giving a total of approximately 1 wolf per 159 ungulates. Because the preferred prey species were mule deer and elk, 12 mule deer and 60 elk maintained a wolf density of 1 per 225 km^2.

Wherever either white-tailed or mule deer and wolf ranges coincide, deer are the preferred prey species (Mech 1970, Carbyn 1974). However, wolves are opportunists and adapt to local conditions.

Wolves apparently are not able to survive on small mammals

for extended periods of time. Mech (1970) stated that wolves probably expend more energy than is gained by preying on animals of snowshoe hare size and smaller. However, wolves sometimes spend considerable time hunting mice (Murie 1944). Also, I have seen evidence of their catching and eating Spruce Grouse (Canachites canadensis) in northeastern Minnesota. Mech (1970) cited an example of wolves feeding on a large number of flightless ducks. Carbyn et al. (1975) found wolves regularly eating garbage at dumps.

Reproduction

Den sites. Clark (1971) examined 9 wolf dens on Baffin Island and concluded that 6 factors (suitable soil structure, supply of water, early disappearance of snow, good drainage, good visibility, and convenient access to prey) influenced wolf den site selection. Stephenson (1974) agreed with Clark on all criteria except visibility. Stephenson stated that wolves usually locate dens on an elevated site; however, he believes the reason is good drainage instead of good visibility. Joslin (1966) found that visibility ranged from 1.5 m to 60 m and averaged only 30 m for 6 dens in Algonquin Provincial Park. Carbyn (1974) believed that den site selection is based mainly on drainage and the nature of soil and found that visibility was generally poor. Mech (1970) concluded that wolves prefer elevated areas near water and that visibility was not important.

Stephenson (1974) examined characteristics of 28 wolf den sites in the Brooks Range and on the North Slope of Alaska. He found that dens were usually found on a moderately steep, south-facing slope in relatively well-drained soils (usually sand) near a source of water. The dens occurred in a variety of land forms, including cutbacks, blowouts, dunes, kanes, and various types of moraines and escarpments. South-facing aspects are important because they are the first to thaw and dry out. Naturally occurring rock formations were used and in some cases provided virtually unchanging den sites for decades. Most dens were located from 3 m to 30 m above the level terrain.

Distance from water is important. Joslin (1967) described 6 dens and all but 1 were within 15 m of water. Two dens observed by Murie (1944) in Mt McKinley National Park were within 30 m of water. Carbyn (1974) found that all wolf dens except 1 in Jasper National Park were less than 400 m from a stream and the exception was approximately 400 to 800 m from a river.

Wolves tolerate a varying degree of human disturbance at den sites. Mech (1970), after reviewing the available literature, concluded that the degree of disturbance, history of the pack's encounter with humans, and availability of substitute dens influence whether dens will be abandoned after human disturbance. Murie (1944) entered a wolf den and removed a pup without causing the wolves to leave. Joslin (1967) found that of 5 dens disturbed in Algonquin Park,

none were re-used the following year. Carbyn (1974) reported that wolves left den sites 4 times in Jasper National Park after direct human disturbance or after humans had approached within "150 to 200 paces." However, he pointed out that perhaps the dens would have been abandoned without the disturbance.

Rendevous sites. Joslin (1967) described 11 rendevous sites in Algonquin Park. All but one bordered a bog that had a small amount of open water with a maximum field of vision of 90 m. The exception was situated on a point of land between 2 lakes and had a view of approximately 360 m, mostly over water. Carbyn (1974) found that rendevous sites were usually in open areas close to water in Jasper National Park; open meadows were often included and steep, glacially formed ridges connected rendevous sites with dens. A typical rendevous site reported by him contained extensive open meadow and mud flats bordered by coniferous forests. Kolenosky and Johnston (1967) examined 5 rendevous sites, all in well-drained areas next to beaver ponds or swamps.

Cover

Assessing the importance of cover or shelter to such an ubiquitous species as the wolf is difficult. Because wolves are major predators, they have few natural enemies; man is one foe who could cause a need for escape cover. Approximately 80% of the reports I

collected were made in or near either wilderness or defacto wilderness areas or national parks. Mech (1975) also pointed out that most wolves in the continental United States, excluding Alaska, were located either in or near large expanses of wild areas. He goes on to question whether wolves are found in wild areas because that is preferred habitat, or because wild areas are the only places humans will allow wolves to exist. Wolves have been tolerated only in areas where man had the least to lose. Areas where ranching was profitable were also areas of highest productivity in terms of prey species, especially deer and elk. Those areas were settled and wolves were eliminated or forced back into remote, less-productive, mountainous areas. Wolves were never abundant in rugged mountainous areas, perhaps because prey species were not as abundant as on the plains or in the foothills. One of the last ranching areas where wolves were eliminated was the Musselshell River breaks in central Montana. This was a rugged area characterized by breaks, isolation, and bushy draws, and apparently provided wolves with good escape cover (Curnow 1968).

Wolves are highly intelligent animals and small groups of them apparently survive in mountainous areas. Because prey species generally migrate out of high mountains to winter in areas more accessible to man, wolves that follow the seasonal movement are susceptible to man. Therefore, single wolves that could survive on small numbers of prey or perhaps on a single winter-killed or

weakened bull elk or moose that did not reach its winter range may have a higher survival rate. Obviously reproduction or recruitment of some kind takes place. But, given the situation I have described, few pups would survive, thus continuously depressing any increases.

Limiting Factors

Space does not appear to be a factor limiting the increase in numbers and distribution of wolves in the northern Rockies. The Scapegoat, Bob Marshall, and Great Bear Wilderness areas and Glacier and Waterton Lakes national parks provide an almost continuous stretch of wild country approximately 14,575 km^2 in extent. Montana also has other wild areas even though they are not designated wilderness. The Gravelly, Ruby, and Tendoy mountains of southwestern Montana, and the Continental Divide forming the Idaho-Montana border, all provide fairly continuous wild country.

Elk and white-tailed deer numbers are high in western Montana. The northern elk herd in Yellowstone National Park suffers a high annual winter kill. Prey numbers, especially when domestic sheep and cattle are included, seem high enough to maintain a larger wolf population than now occurs in the northern Rockies.

Denning and rendevous sites apparently are not limiting factors. Likewise space and cover do not appear to be significant limiting factors. Because wolves are most active after dark, they

make good use of available cover.

I believe a combination of space, cover, and human attitudes, which can be considered a component of habitat, act to limit wolf numbers and distribution in the northern Rockies. Enough square kilometers of wild country are available in the northern Rockies for a large number of wolves. However, that space is not usable at all times of the year. When prey species move to winter ranges, wolves must follow. Elk and deer often winter in the foothills on or adjacent to ranches. In winter then, wolves may be susceptible to being killed, either purposefully or accidentally, by man. In southwest Montana and adjacent Idaho, high mountain ranges such as the Gravelly and Tendoy mountains are grazed throughout summer and early fall by sheep and cattle. Sheepherders and range riders are responsible for the safety of stock in their care. Coyotes are regularly shot and poisoned. Conceivably, wolves could be mistaken for coyotes and killed also.

Human attitudes and ignorance are major factors of the habitat limiting wolf numbers. Few local people are aware of NRMW's endangered status. The few who are aware do not seem to realize what endangered status means or what the penalties are. Once these people are informed of the law they seem to pay it little attention. This is not a localized problem; Weise et al. (1975) stated that the most important factor in the failure of 4 wolves translocated from

Minnesota to upper Michigan to survive, was the attitude of humans towards wolves. They further state that an inverse relationship between human density and wolf density in the Great Lakes Region exists. Van Ballenberghe (1975) and Mech (1977) reported a similar attitude in northern Minnesota.

Hendrickson et al. (1975) discussed the significance of even a very low mortality rate given a small population of wolves made up mainly of lone animals. Any additional human-caused mortality could act to severely dampen population increases because wolves do not breed until they are 2 or 3 years old. Killing a mature wolf could significantly delay breeding until a young animal matured and found a mature member of the opposite sex (Hendrickson et al. 1975).

CHAPTER VI

MANAGEMENT CONSIDERATIONS

Three options (increase, maintain, or decrease wolf numbers) are available for managing wolves in the northern Rocky Mountains. According to the Endangered Species Act of 1973, only the first can be considered.

Increasing Wolf Numbers

Wolf numbers can be increased by transplanting or, assuming a small resident population of wolves occurs in the northern Rocky Mountains, by nurturing that population until it increases on its own.

Transplanting wolves into NRMW range. Transplanting is the quickest method of increasing wolf numbers in an area; however, transplants should not be attempted while there are wild wolves using an area. Mech (1975) considers transplanting wolves a last resort that should be done only when no solid evidence of resident wolves exists.

Animals for transplants should be genetically similar to NRMW and from an area geographically similar to the northern Rocky Mountains. Using captive wolves should be avoided. Mech (1975) suggests using wolves from a subspecies adjacent to the one being replaced if necessary.

In this case C. l. columbianus or C. l. occidentalis could be used. Wolves with a history of livestock depredations should under no circumstances be used for transplant purposes even though those wolves may be available (Mech 1975).

When possible, Mech (1975) recommends transplanting wolf packs or at least key individuals of a pack rather than random individual wolves. To maximize the possibility that released wolves will remain in a general area, they should be habituated to the area. Weise et al. (1975) kept wolves in a large holding pen at the release site for a week. Mech (pers. comm.) indicated that a longer habituation period may have been necessary in the Michigan transplant. Weise et al. (1975) concluded that the release date of March 12 in the Michigan transplant may have been too late in winter. An earlier release date with corresponding deeper snow to inhibit wolf movements may have influenced the wolves to remain closer to the release site. More research should be done on this problem.

Wolf translocations conducted in Upper Michigan and northern Minnesota indicate that transplanted wolves probably will not establish a home range centered around the release site. Therefore, as Weise et al. (1975) points out, the site where wolves are relocated to should be large enough to allow for initial wandering. As was done in the Michigan translocation, transplanted wolves should be radio-collared and their movements and activities closely monitored.

The legal implications of releasing wolves into an area have not been established. Mech (1975) notes the possibility of lawsuits involving persons or agencies responsible for transplanting wolves into an area, perhaps years after the transplant was made. Who, if anyone, would be responsible for livestock losses inflicted by transplanted wolves 2, 5, or 20 years after the transplant?

Along with a transplant program must go a comprehensive, long-range management plan. Methods must be worked out in advance to recapture or kill dispersing wolves traveling outside areas set aside for wolves. Control of wolf populations may also be necessary within designated wolf areas (Mech 1975).

Nurturing present populations. Assuming that a population of wolves is present in Montana, efforts should be made to increase that population before transplants are attempted. The first and most important action is to decrease losses due to man's activities. An intensive information and education program must be launched to change public attitudes. Provisions and purposes of the Endangered Species Act should be publicized. Advantages of having wolves in national parks and wilderness areas should be presented, including benefits to uncontrolled prey populations and esthetic values for backcountry users. Stricter enforcement of the law than we presently have may become necessary. An intensive research program should be maintained. To

assess the success or failure of the enforcement and public education programs, biotelemetry could be used to monitor wolf populations.

Other methods of increasing a resident population are to increase prey numbers, reduce natural mortality, and reduce competitors. All of these are either impractical or have adverse side-effects.

A capture-release program, in conjunction with an ongoing research program, could increase a particular wolf population by transplanting wolves from another area. For example, wolves in Glacier National Park may increase faster than those in the Big Hole area. Wolves from Glacier National Park could be used to supplement the Big Hole population.

Increasing the number and size of wilderness areas may also help resident populations. Expanding existing wilderness areas would be preferred because a number of small, isolated wilderness areas probably would not significantly increase wolf populations.

Minimizing Conflicts

Increased wolf numbers will involve wolf damage to livestock (Mech 1975). As numbers increase, animals dispersing out of wild areas may establish home ranges in ranching areas. Such dispersal is currently happening in northern Minnesota (Mech 1977). A number of steps can be taken to minimize livestock/wolf problems, but most

remedies involve controlling wolf numbers. However, according to the Endangered Species Act of 1973, no endangered species can be "taken" for any reason but research or human safety.

Livestock loss compensation. One way of appeasing ranchers who suffer losses to wolves, or to any other classified predator, is to compensate them for their losses. Ontario has enacted the Wolf Damage to Livestock Compensation Act which provides for a cash payment for livestock losses to wolf predation (Theberge 1975). Problems exist in determining cause of death and affixing a price on the livestock. Compensation paid on an experimental basis to a sheep rancher in western Montana for losses to coyotes showed that costs can be very high (Henne 1975, Munoz 1976).

Grazing leases. In most areas of the northern Rockies, ranchers lease federal land from the USFS and BLM. In areas where wolves occur, these leases could be rescinded or written in such a way as to make the leasee absorb any livestock losses to wolves. However, in some areas, this may cause a significant hardship to ranchers who depend on USFS or BLM grazing leases for summer forage. Also, instead of accepting losses to wolves, some ranchers may remove the offending wolves from their leased area secretly by poisoning, trapping, or shooting. Because the leases are often in remote, rugged areas, enforcement would be almost impossible.

Behavior modification. If livestock losses became significant in an area and only certain wolves were involved, behavioral modifications such as those being tested on coyotes could be used. However, experiments with coyotes show that results are seldom significant or long-lasting. Research is continuing on this problem and behavioral modification such as taste aversion may prove feasible in the future.

Designating wolf areas. Mech (1975) suggests designating areas where wolves will be protected, and other areas where they will not. Such designations would involve either declassifying wolves in some areas or amending the Endangered Species Act. Mech (1975) goes on to say that boundaries of areas should be determined and any wolves outside those areas should be either trapped and moved within the boundaries, or killed, depending upon the density of wolves within the designated wolf areas. Theberge (1975) points out that the technology exists to eliminate wolves. If areas were designated, a research program would be necessary to determine density, effects on prey species, and movements in and out of designated areas. In any case, a detailed, comprehensive management plan must be worked out and implemented in each designated wolf area. Perhaps a ceiling number of wolves in the designated areas or in the total region should be set. When that number is reached, NRMW could be removed from

endangered status and be classified as threatened or totally declassified.

Mech (1975) points out that, given a certain set of conditions, wolves may significantly decrease prey populations, especially deer. In Minnesota, a combination of advanced habitat succession, a series of hard winter, and wolf predation is severely lowering white-tailed deer numbers. Therefore, in designated wolf areas, controlling wolves to benefit prey populations may become necessary.

A combination of these various methods may be necessary if wolf populations are to increase. Probably the most important is the designation of areas where wolves will and will not be allowed to exist. In designated wolf areas, grazing leases could be rescinded or re-written to allow for losses to wolves. A ceiling number should be decided upon for each area. When the wolf population reached that ceiling, the population could be controlled (perhaps with a live capture-release program). Compensation to ranchers for livestock losses to wolves should be considered as a last resort. Such payments could amount to several million dollars because coyote kills may be mis-taken for wolf kills and few competent field personnel are available to check backcountry kills (O'Gara pers. comm.).

Measures such as these should indicate to ranchers that land management agencies are concerned with the well-being of their ranching operations. Such reassurance may help to change public

attitudes and insure the survival of wolves in this portion of the Rocky Mountains.

Suggested Wolf Inventory Procedures

To properly manage a species, information concerning numbers and locations of animals is necessary. The following are suggestions concerning wolf inventory procedures:

1) A concerted effort should be made by land management agencies to educate their personnel in terms of the Endangered Species Act of 1973, wolf identification and ecology, and the need for collection of all available information on wolves in the northern Rockies.

2) After Step 1 is completed, each employee should be encouraged to explain the need for information to anyone they come in contact with during their normal course of duties (e.g., ranchers, hunters, fishermen, etc.).

3) Standard observation forms such as the ones I developed and used should be distributed and their use implemented. One person or office should have responsibility for the collection of completed forms. Interagency cooperation is necessary. The central collecting office should have knowledgeable personnel available to check out promising reports immediately.

4) State and federal biologists should conduct wolf surveys in conjunction with other wildlife surveys. Especially important may be

late winter carrion surveys and ground surveys of tracks on the edges of winter ranges. These surveys should be done on a calm day about 2 days after a snowfall and should include howling.

5) As funds become available, aerial (preferably helicopter) surveys should be made with the specific purpose of searching areas occupied by wolves. Again, fresh snow would facilitate observations. Tracks should be measured, photographs taken, casts made, etc. if the tracks are within wolf-size parameters. Scats should be collected and analyzed.

6) As information is collected, areas with consistent reports may be delineated. At that time, extensive ground surveys should be conducted, but with researchers being careful not to disturb any wolves present.

7) Trapping and radio-collaring wolves will yield the most information concerning population size, prey sources, home ranges, recruitment, etc. However, given a small, unstable population, a decision must be made whether or not the benefits of radio-collaring to the wolf population will be worth the money, time, and harassment of that population.

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APPENDIX A

SUMMARY OF WOLF OBSERVATION REPORTS COLLECTED

Observer (grade)	Date	Location		Color or size of tracks	No. of wolves	General remarks
		General	Legal			
John Harrington (VG)	5/16/76	Haskel Pass	T28N R25W, Sec. 27 NE	Very dark, charcoal	1	Hind quarters less hefty than front
Bob Siebert (VG)	8/30/76	Coal Creek	T31N R16W	4 5/8" X 3 7/8"	1	Photo taken of track
Walt Ripley (VG)	2/76	Autumn Creek	T29N R14W	Light, almost white	1	Twice size of small German shepherd dog
Mike Keller (VG)	7/17/76	South Fork, Two Medicine River	T29N R13W, Sec. 3	Light	1	Used 9 power scope at 400 yards
Lee Downs (VG)	1/75	Muskrat Creek	T28N R12W, Sec. 23	~4" wide track	1	Followed tracks for 1 mile
Lee Downs (VG)	2/75	Pool Creek	T28N R12W, Sec. 7	~4" wide track	1	"Good stride"
Allen Schallenberger (VG)	8/12/75	Lost Shirt Creek	T29N R12W, NESW 7	~4" X 4" track	1	Difficult to reach area because of flood conditions
Ray Mills (VG)	7/11/75	Badger Creek	T29N R11W, SWNE 29	Much larger than German shepherd track	1	Difficult to reach area because of flood conditions
Grant Gallup (VG)	10/21/75	Townsend Creek	T29N R13W, NWNE 10	Largest track about 4" long, other slightly smaller	2	Dead moose in area had been since summer or early fall
Allen Schallenberger (VG)	11/13/75	False Summit	T30N R13W, NWNW 13	Very light yellow gray track 3 3/4" X 3 1/2"	1	Backtracked wolf for about 4 miles, ignored roads and trails
Allen Schallenberger (VG)	7/23/75	North Fork of Badger Creek	T28N R12W, NWSW 8	4" X 4"	1	Photo taken of track
Boise O'Neil (VG)	6/1/76	Desert Mtn.	T31N R18W	Light gray	1	Size of large German shepherd dog
Jazz Orr (VG)	10/10/75	Heart Butte Mtn.	T29N R10W	Deer colored--broadside real dark--facing	1	"Thought it was WTD"
Ted Orr (VG)	6/76	Dog Gun Lake	T30N R12W, Sec. 13	Golden, light colored	1	"90-100 lb. police dog"
Ted Orr (VG)	7/5/76	Mettler Lake	T30N R12W, SW 16	Dark gray, back darker	1	90-100 lb. big German shepherd; fat

Observer (grade)	Date	Location		Color or size of tracks	No. of wolves	General remarks
		General	Legal			
Allen Schallenberger (VG)	6/18/76	Hall Creek	T30N R13W, NWSE 23	5" X 4", 18" toe-to-toe stride	1	Cast made of track
Frank Horak (VG)	6/27/76	South Fork, Two Medicine River	T30N R13W, SENW 33	Large one--gray, darker on face and back; smaller one--darker gray	2	Dog with Horak ran up and sniffed smaller wolf; wolf acted submissive
Arlie Burk (VG)	1/74	Barnaby Creek		Light gray	1	Young ♂, 55 lbs., killed in trap
John Adams (VG)	3/73	17 Mile Creek Rd.	T37N R33W, SW 26	4"+	1	Slides taken of tracks and scats
Phil Lowman (VG)	11/74	Jungle Creek	T37N R33W, Sec. 16		2	Howling--15 minutes
John Adams (VG)	3/73	Upper North Creek	T36N R33W, Sec. 7	~ 4½"	1	
Phil Lowman (VG)	3/21/73	17 Mile Creek	T34N R32W, NW 27	Black, 5½"	1	6 observers, estimate weight at 110 lbs.
Jerry DeSanto (VG)	5/22/75	Rafferty's Homestead, GNP	T35N R21W, SE 3	Light-colored with some dark guard hairs, black tipped tail	1	2 other observers
Terry Penttila (VG)	10/10/76	Two Dog Flat, GNP		Black/grayish, mostly black	1	Picture taken; ~ 70-80 lbs.
Ralph Waldt (VG)	10/9/76	Dutch Creek, GNP	T33N R21W		1	Howling--5 seconds
Ralph Waldt (VG)	9/25/76	Camas Creek, GNP	T34N R19W, Sec. 12		1	Scat
Bob Frausson (VG)	1/7/77	Two Dog Flat		Dark, towards brown-gray	1	"Big as police dog"
Dick Bridegroom (G)	8/15/76	Divide Peak on Blackfeet Res.		Gray-brown	1	"Too large for coyote"
Rick Mace (G)	6/20/76	Shorty Creek	T35N R23W, Sec. 18	Light gray	1	"Larger than any coyote I've ever seen"
Dick Bridegroom (G)	8/25/76	Chief Mtn. Hwy.		Gray-brown	1	~ 70-80 lbs., feeding on carcass of animal

Observer (grade)	Date	Location		Color or size of tracks	No. of wolves	General remarks
		General	Legal			
Jammy (G)	8/75	Trail Creek Rd.		Dark grayish brown	1	Size of large German shepherd dog
Jammy (G)	5/75	Trail Creek Rd.		Dark grayish brown	1	Size of large German shepherd dog
K. Wheeler (VG)	10/68	SW of Heart Butte	T28N R10W, Sec. 4	Light-colored	1	"Thought it was a deer at first"
M. F. Keller (G)	7/23/76	Near Walton Goat Lick	T29N R16W, NE 25	Dark gray	1	~36" high at shoulders
T. Greenwood (G)	5/67	Major Steel Back-bone	T28N R10W, Sec. 16	Gray, tones of black and white	5	1 ♀, 4 pups at den
Jan Welker (G)	8/62	Great Northern Mtn.	T29N R16W	Almost black	1	Bigger than most German shepherd dogs
Ray Mills (VG)	9/71	Elbow Creek	T28N R12W, Sec. 9	Large tracks	1	
Jazz Orr (G)	9/72	E. of Heart Butte	T29N R10W, SW 28	Dark when facing, lighter when turned away	4	1 adult and 4 pups, could see teats on adult
Ray Mills (G)	5/72	Mt. Baldy	T29N R12W, NW 2	Gray to light gray	1	150 yards with 7 power binoculars
Ted Sholer (G)	10/75	Great Bear Creek	T31N R18W, NE 13	Howling, 15-30 seconds	1	Sure it was not coyote
William Emrick (G)	11/30/75	False Summit	T30N R13W, NE 10	Difficult to see due to light conditions	1	Crossed railroad tracks in front of train
A. R. Mathews (G)	Spring/75	Scoffin Butte	T28N R8W, NW 31	Buffy color	1	Mule deer wintering in area
Allen Schallenberger (G)	11/21/75	Hyde Creek	T30N R12W, NWSE 22	4" X 3"	1	About 30 elk just moved into area
Ted Orr (G)	6/74	Dog Gun Lake	T30N R12W, Sec. 13	All light colored	3	1 wolf was shot in leg, not killed
Jazz Orr (G)	Summer/74	SSW of Heart Butte	T29N R10W, Sec. 24	Fairly dark colored	1	
A. R. Mathews (G)	1/75	Scoffin Butte	T28N R8W, Sec. 31	Larger--fairly dark; smaller--lighter	2	Adult and pup

Observer (grade)	Date	Location		Color or size of tracks	No. of wolves	General remarks
		General	Legal			
Wayne Tate (G)	4/73	Middle Fork of Flathead River	T31N R18W, NW 7	Dark gray	3	~100-125 lbs.
A. R. Mathews (G)	Jan-Feb/76	Scoffin Butte	T28N R8W, Sec.31 NW	Tracks 2-3 times larger than coyote		Mule deer winter range
Dick Mattson (G)	7/17/76	Ole Creek	T30N R14W	Tracks	1	Photo taken
R. Seibert (G)	7/5/76	Park Creek	T30N R15W	4" X 3½"	1	Photo taken
S. Young (G)	9/25/76	Coal Creek		4.5" X 4.5"	1	
R. Hanley (F)	Fall/74	Noggle Creek	T28N R33W, Sec. 3	(No color reported)	1	Size of tall golden retriever
D. Topp (F)	Fall/72	Ole Creek	T29N R16W, NE 14	Dark (?)	1	Animal in shade so color difficult to see
W. C. Rohde (F)	12/74	Devil Creek	T29N R15W	Color not apparent (observation at night)	1	Sure not a coyote
E. Hedstrom (F)	Winter/71	E. of Summit	T30N R13W	Light-colored, some brown	1	Night observation
Chas. Thomas (F)	Fall/68	Hyde Creek	T30N R12W	"Pretty light colored"	1	~70 lbs.
D. MacRae (F)	3/69-70	Bear Creek		Both gray	2	1 about 20-30 lbs. heavier than other
Ray Wilson (VG)	4/74	Near Muskrat Pass	T28N R12W, Sec. 33	One dark gray on whitish	2	Very similar to Gleason's observation 8 mos. later
Ralph Harris (G)	12/75	Off Hwy 2	T31N R17W	All gray	3	
Harry Hash (G)	9/70		T23N R13W, Sec. 12	Dirty gray	2	One other observer
Clair Judge (G)	Early fall/72		T24N R13W, Sec. 26	Howling	2-3	Lasted 15-30 minutes
Dennis Olson (G)	10/72		T5S R1W, Sec. 9	Light gray	1	
Phil Farnes (VG)	11/25/72		T7S R1E, Sec. 20	Dark, steel gray	1	
Ike Walker (F)	11/73	Miner Lake Rd.	T6S R16W, Sec. 10	Gray, dark gray	1	

Observer (grade)	Date	Location		Color or size of tracks	No. of wolves	General remarks
		General	Legal			
John Burwell (G)	1 or 2/74	Shoestring Meadows	T4S R12W, Sec. 14	Tracks 150 mm long	1	Two other observers
Bill Baker (VG)	5-6/74		T7S R1W, Sec. 21	Gray, dark gray	5	Two adults, 3 pups at den
Spud Kane (G)	Fall/74	Sawlog Creek		Howling	1	
Bob Neal (VG)	10/14/74	Ruby Reservoir	T7S R4W	106 mm X 106 mm tracks	5-6	Killed deer
Tom Pierce, Jr. (G)	11/74	Reservoir Lake	T8S R15W, Sec. 20	Gray	1	Three other observers
Bob Neal (VG)	6/20/75	Wigwam Creek	T8S R2W	Gray, dark gray	2	Aerial observation and tracks
Austin Parsell (G)	Summer/75	Bear Wallow	T4S R13W, Sec. 27	Dark gray	1	
Austin Parsell (G)	Summer/75	Shoestring Meadows	T4S R12W, Sec. 18	Dark gray	1	
Bill Baker (G)	Summer/75		T6S R1W, Sec. 23	Gray	1	
Bill Baker (G)	Summer/75		T6S R1W, Sec. 26	"Blueish"	1	
Mike Cartee (VG)	8/75	Wigwam Creek	T8S R2W, Sec. 9	Howling	1	Lasted 12-15 seconds
Ike Walker (G)	10/75	Black Mtn.	T5S R11W, Sec. 19	100 mm long track	1	Three other observers
Al Lawson (VG)	1/76		T4S R16W, Sec. 6	Gray	2	Two other observers
Tex (VG)	5-6/76		T4S R16W, Sec. 6	Gray	2	Two other observers
Steve McIntosh (VG)	7/17/76	Badger Pass	T7S R11W, Sec. 4	Howling	1	Two other observers
Dennis Daneke (VG)	8/9/76		T7S R14W, Sec. 21	Howling	1	Elicited howl
Dan Sagota (G)	late Aug/76		T6S R1E, Sec. 20	Gray	1	One other observer
Grant Stricklen (F)	10/25/76		T4S R12W, Sec. 21	Gray	1	
Al Lawson (G)	10/75		T2S R14W, NE 29	Howling	1	
Dennis Daneke (G)	6/7/76	Proposal Rock	T2S R14W, NW 33	4⅞" X 4"	1	
Tom Schurr (VG)	Winter/64		T9S R1W, Sec. 11	Silvery gray	2	
Sam Shorr (VG)	9/68	Black Canyon	T11S R14W, Sec. 20	Gray	1	One other observer

Observer (grade)	Date	Location		Color or size of tracks	No. of wolves	General remarks
		General	Legal			
Ned Wellborn (G)	Fall/69	Medicine Lodge Cr.	T10S R11W, Sec. 7	Gray	1	
Buz Jebson (F)	1/70	Chinatown	T18N R27E, Sec. 16	Dark gray	11	
Ed Curnow (F)	Winter/71		T13S R45E, Sec. 10	Dark gray, gray	6	Aerial observation
Ed Curnow (F)	Winter/71	Red Canyon Fault	T11S R44E, Sec. 26		6	
Bob Neal (VG)	7/71		T11S R2W, Sec. 8	100 mm long tracks	2	Cast made of tracks
Bob Neal (VG)	9/15/71		T11S R2W, Sec. 8	100 mm long tracks	2	Cast made of tracks
Marvin Amundson (G)	9/71		T12S R12W, Sec. 12	Gray	1	
Don Detton (VG)	10/71	Little Sage Creek	T12S R7W, Sec. 5	Gray	1	
Bob Neal (VG)	12/71	Robb and Rock creeks		117 mm long track	1	Three domestic sheep killed
Larry Fisher (VG)	7/72	Flume Creek	T10S R24E, Sec. 9	Gray-tannish-white	2	
Don Detton (VG)	10/72	Little Basin Creek	T12S R35E, Sec. 31	Chocolate brown	1	Three other observers
Bill Hildreth (F)	11/72	Deer Canyon		Gray	6	
Matt Vranish (VG)	7/27/73		T10S R9W, Sec. 13	Gray	2	
Matt Vranish (G)	7/29/73		T10S R9W	Gray	2	
Bruce Jones	11/73	Black Canyon	T11S R26E, Sec. 27	100-110 mm X 90 mm	1	One other observer
Tom Schurr (F)	Winter/74	Madison River	T9S R1W, Sec. 11	Unknown	10	One other observer
Ned Wellborn (F)	6/74	Horse Prairie Valley	T9S R13W, Sec. 34	Light gray	1	One other observer
Tom Pierce, Jr. (G)	6/74		T11S R11W	Light colored, tan	1	
Bruce Jones (G)	7/74	Bell Canyon	T18N R30E, Sec. 23	Buff gray	1	
Bill James (G)	10/74	Black Canyon	T18N R26E, Sec. 26	Grayish-brown	2	
Bruce Jones (VG)	10/74	Nip & Tuck Creek	T18N R26E, Sec. 33	100-115 mm long track	1	One other observer
Dick Carpenter (VG)	12/74	S. end of Gravelly Range		Tracks not measured	2	Aerial observation

Observer (grade)	Date	Location		Color or size of tracks	No. of wolves	General remarks
		General	Legal			
Mike Cartee (VG)	7/16/75	Black Butte	T11S R2W, Sec. 4	Howling	2	Elicited howling
Carl Guillette (G)	7/75	Short Creek	T16N R28E, Sec. 15	Dark yellow gray	1	Four other observers
Bruce Jones (G)	10/75	Rock Canyon	T12S R11W, Sec. 5	100-115 mm long	1	One other observer
Ned Wellborn (F)	12/75	Muddy Creek	T13S R11W, Sec. 6	Very dark	1	Three other observers
Floyd Wheekly (G)	12/75	Dad Creek	T12S R12W, Sec. 20	Dark gray	1	One other observer
Larry Fisher (VG)	6/17/76		T9S R15W, Sec. 16	Gray yellowish	1	Pup
Wally Basye (VG)	7/13/76		T10S R15W, Sec. 28	Howling	1	Lasted 15 minutes
Gary Day (VG)	8/11/76		T9S R15W, Sec. 16	Howling	1	One other observer
Dennis Daneke (VG)	8/12/76		T9S R15W, Sec. 16	Howling	1	
Diane Schroder (VG)	10/4/76		T10S R15W, Sec. 24	Reddish-brown	1	One other observer
Ike Walker (F)	Fall/76	Bell Canyon	T10S R11W	85 mm wide	1-2	
Delon Potter (VG)	11/28/76	Bear Gulch	T11S R15W	Tracks not measured	1	One other observer
Gene Hildreth (VG)	Spring/76	Dixon Mtn.	T13S R11W	Howling	1-2	Howling heard several times
Gene Hildreth (VG)	Late fall/76	Dixon Mtn.	T13S R11W	Howling	1-2	Howling heard several times
Red Rocks Refuge Personnel (G)	Winter/70	Tom Creek	T14S R1W, Sec. 26	Gray	1	Seen several times during winter
Don Detton (VG)	9/73	Little Sheep Creek	T14S R9W, Sec. 25	Gray, Chocolate brown	2	Adult and pup
Tom Bramlette (G)	10/73	SW of Lima	T14N R29E, Sec. 19	Dark, silvertip	1	Three other observers
Bill Hildreth (G)	1/74	Little Sheep Creek	T15S R9W	Tracks	6	
Andy Ogden (VG)	1/20/74		T15S R6W, Sec. 21	Charcoal gray, gray	2	One larger than other
Weldon Buhler (VG)	Fall/74	Sawmill Creek	T15S R33E, Sec. 23	Dark	2	One larger than other
Pat McKenna (VG)	4/75	Centennial Valley	T14S R2W, Sec. 26	Tracks not measured	1	
Fran Jensen (G)	9/75	Little Sheep Creek	T15S R32E, Sec. 21	Tracks 125 mm long	6	

Observer (grade)	Date	Location		Color or size of tracks	No. of wolves	General remarks
		General	Legal			
Dick Carpenter (VG)	10/75		T14S R2W, Sec. 26	~100 mm long	1	
Harry Allen (F)	10/75	Little Sheep Creek	T15S R9W, Sec. 3	Gray, blackish-brown, lighter gray	6	♂, ♀, and 4 pups
Dick Carpenter (VG)	11/75	SW of Lima	T15S R9W, Sec. 6	Tracks 117 mm long	1	Photo taken
Don Detton (VG)	11/75	Little Sheep Creek	T15S R8W, Sec. 31	Gray, 100-125 mm long tracks	4	
Andy Ogden (VG)	Fall/75	Monida Pass	T15S R5W, Sec. 7	Dark	3	One other observer
Weldon Buhler (VG)	Fall/75		T15S R8W, Sec. 18	Gray, dark gray	1	
Norton Miner (VG)	12/75	Garfield Mtn.	T15S R8W, Sec. 19	Tracks	1	Photo taken
Harry Allen (F)	12/75	Little Sheep Creek	T15S R9W	Howling	4-6	
Bill Peterson (VG)	12/75	Caboose Canyon	T14S R10W, Sec. 15	125 mm long	1	Two other observers
Fran Jensen (G)	2/76	Little Sheep Creek	T15S R8W	Dark gray, 125 mm long track	2	
Bill Peterson (G)	2/76		T14S R10W, Sec. 34	125 mm long tracks	2	
Bill Kolar (VG)	12/10/76	Sawmill Creek	T15S R8W, Sec. 26	Brown	1	
Dennis Daneke (F)	1/77	Muddy Creek	T14S R10W	150 mm X 100 mm	4-6	Tracks difficult to measure